L43: Entry 1 of 7 File: USPT Jul 8, 2003

US-PAT-NO: 6589136
DOCUMENT-IDENTIFIER: US 6589136 B2

TITLE: Engine power boost control system

DATE-ISSUED: July 8, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Ephraim; Stephen Russell	Cedar Falls	IA		
Miller; James Anton	Cedar Falls	IA		
Farr; Marvin Kenneth	Waverly	IA		
Pipho; Michael John	Dunkerton	IA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Deere & Company	Moline	IL			02

APPL-NO: 09/ 800848 [PALM]
DATE FILED: March 6, 2001

INT-CL: [07] F02 O 41/30, B60 K 41/04

US-CL-ISSUED: 477/111; 701/104, 701/54, 123/350
US-CL-CURRENT: 477/111; 123/350, 701/104, 701/54

FIELD-OF-SEARCH: 123/350, 123/396, 701/104, 701/110, 701/102, 701/54, 477/111

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4522553	June 1985	Nelson et al.	414/526
5508923	April 1996	Ibamoto et al.	364/426.01
5715790	February 1998	Tolley et al.	123/396
6199006	March 2001	Weiss et al.	701/102
6347272	February 2002	Flammersfeld et al.	701/93

OTHER PUBLICATIONS

Marvin Farr, "Electronic Controls for John Deere Diesel Engines", Feb. 27, 1989, pp. 13-16 & 21.
Deere & Company, Engine Control System Specification--Rev. 2B, Sep. 1989 (3 pages).

Agricultural Engineering, "50 Outstanding Innovations--1991 ---Engine Helps Maintain Speed During Harvesting", (date unknown), (2 pages).

ART-UNIT: 3747

PRIMARY-EXAMINER: Wright; Dirk

ASSISTANT-EXAMINER: Castro; Arnold

ABSTRACT:

A power boost control system is provided for an agricultural vehicle with an engine which is normally governor controlled to run at throttle-selected constant engine speed up to a normal or rated engine speed. The power boost control system receives a road speed signal. Power boost is enabled if the sensed road speed is greater than an "on" threshold, above which is considered to be a transport speed. Power boost is disabled if sensed road speed is less than an "off" threshold, below which is considered to be less than a transport speed. When power boost is enabled, the controller will increase maximum power limits to above normal levels, so that, for example, the desired road or transport speed can be maintained as the vehicle goes up a hill.

15 Claims, 15 Drawing figures

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L43: Entry 1 of 7 File: USPT Jul 8, 2003

DOCUMENT-IDENTIFIER: US 6589136 B2
TITLE: Engine power boost control system

Detailed Description Text (19):
Step 126 re-initializes the OFF counter and directs the algorithm to step 104. Thus, algorithm 100 enables engine power boost for a limited, spaced apart time period whenever the transmission (not shown) is in a higher gear ratio and sensed temperatures are in normal ranges.

Detailed Description Text (33):
Thus, algorithm 200 enables engine power boost for limited, spaced apart time periods whenever the transmission 11 is in a higher gear ratio and sensed temperatures are in normal ranges, and selects a maximum fuel level as a function of the gear ratio of the transmission 11.

Detailed Description Text (48):
Thus, algorithm 300 enables engine power boost for limited, spaced apart time periods whenever the transmission 11 is in a higher gear ratio and sensed temperatures are in normal ranges, and selects a power boost level as a function of the sensed vehicle speed.

Detailed Description Text (63):
Thus, algorithm 400 enables engine power boost for limited, spaced apart time periods whenever the transmission 11 is in a higher gear ratio and sensed temperatures are in normal ranges, and selects a maximum fuel level as a function of the change per unit of time of a sensed vehicle or engine speed parameter.

Current US Cross Reference Classification (3):
701/54

L43: Entry 5 of 7 File: USPT Dec 5, 1989

US-PAT-NO: 4885690
DOCUMENT-IDENTIFIER: US 4885690 A

TITLE: System for optimizing driving parameters in utility vehicles

DATE-ISSUED: December 5, 1989

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Schimmel; Johannes	Steyr			AT
Bauer; Harald	Steyr			AT
Burian; Gunther	Steyr			AT
Hulla; Heinz	Steyr			AT
Kagerer; Robert	Neuzeug			AT
Kubin; Helmut	Steyr			AT

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Steyr-Daimler-Puch AG	Vienna			AT	03

APPL-NO: 07/ 100163 [PALM]
DATE FILED: September 23, 1987

PARENT-CASE:
CROSS REFERENCE This is a continuation-in-part application of Ser. No. 696,041, filed Jan. 29, 1985 and now abandoned.

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
AT	319/84	February 1, 1984

INT-CL: [04] G05D 13/58, F16H 5/52, F02D 43/04

US-CL-ISSUED: 364/424.1; 74/866, 364/431.07
US-CL-CURRENT: 701/54; 701/110, 701/50

FIELD-OF-SEARCH: 364/424, 364/424.1, 364/442, 434/71, 340/52R, 340/52D, 74/866, 73/118

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4267545	May 1981	Drone et al.	340/52D
4408293	October 1983	Avins	364/424.1
4439158	March 1984	Weber	434/71
4459671	July 1984	Teass et al.	364/442
4485443	November 1984	Knodler et al.	364/424.1
4523281	June 1985	Noda et al.	364/424.1
4541052	September 1985	McCulloch	364/424.1
4542460	September 1985	Weber	364/424.1
4564906	January 1986	Stephan et al.	364/424.1
4570226	February 1986	Aussedat	364/442
4598374	July 1986	Klatt	364/424.1
4701852	October 1987	Ulveland	364/424.1
4737915	April 1988	Hosaka	364/424.1

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
0104784	April 1984	EP	364/442
0106789	April 1984	EP	364/424.1
3128080	February 1983	DE	364/442
8200114	October 1982	WO	
1330350	September 1973	GB	
2084524	April 1982	GB	

ART-UNIT: 234

PRIMARY-EXAMINER: Gruber; Felix D.

ATTY-AGENT-FIRM: Marmorek, Guttman & Rubenstein

ABSTRACT:

A device and method for optimizing operation of a utility vehicle is disclosed. The optimizing device comprises engine and transmission data sensors which input current operating parameters to a microcomputer having a memory containing optimizing programs, thereby enabling the microcomputer to generate optimized commands which are displayed on indicating means so that an operator can adjust the operating controls.

4 Claims, 3 Drawing figures

L43: Entry 5 of 7 File: USPT Dec 5, 1989

DOCUMENT-IDENTIFIER: US 4885690 A
TITLE: System for optimizing driving parameters in utility vehicles

Current US Original Classification (1):
701/54

CLAIMS:

1. A device for optimizing the driving parameters of a farming tractor for use with an agricultural implement, said tractor including an engine having an engine rotational speed controllable by an operator of said tractor and an engine power output, said tractor also including a transmission having a gear position controllable by said operator of said tractor and a rotational speed at its output, said device comprising

a processor,

switch means associated with said processor for enabling an operator of said tractor to select between first and second ranges of engine rotational speed and engine power output, said first and second ranges of engine rotational speed and engine power output corresponding to optimized fuel use and optimized work output per unit time, respectively,

memory means associated with said processor for storing data corresponding to said first operating range and data corresponding to said second operating range, in response to said switch means said processor obtaining from said memory the data corresponding to the selected operating range,

sensing means for sensing data concerning the actual rotational speed and load of said engine and the actual rotational speed and gear position of said transmission and for communicating said sensed data to said processor, said processor processing said sensed data and said data stored in said memory corresponding to said selected operating range to determine how said engine rotational speed and said gear position should be adjusted by said operator to bring said tractor into said selected operating range, and

indicator means responsive to said processor for indicating to said operator how said engine rotational speed and said gear position should be adjusted by said operator to bring said tractor into said selected range to optimize performance with respect to fuel consumption or work output per unit time.

4. A method for optimizing the driving parameters of a farming tractor for use with an agricultural implement, said method comprising the steps of

selecting between first and second operating ranges of engine rotational speed and engine power output of said tractor and communicating said selection to a processor via switch means, said first and second operating ranges of engine rotational speed and power output corresponding to optimized tractor performance with respect to first and second objectives,

in response to said selection, accessing memory means connected to said processor which stores data corresponding to said first and second operating ranges to obtain the data corresponding to the selected one of the operating ranges,

sensing at least the actual engine rotational speed and load of the tractor engine and transmitting the sensed data to the processor,

processing at said processor the data obtained from said memory and the sensed data to determine adjustments in said engine rotational speed and in a gear position of a transmission of said tractor required to bring said tractor into said selected operating range, and

adjusting said engine rotational speed and said gear position in accordance with an output of said processor to bring said tractor into said selected operating range. so as to optimize the performance of the tractor with respect to one of said objectives.

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L23: Entry 1 of 6 File: PGPB Sep 19, 2002

PGPUB-DOCUMENT-NUMBER: 20020133279
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020133279 A1

TITLE: METHOD AND APPARATUS FOR CONTROLLING STRAIGHT LINE TRAVEL OF A TRACKED MACHINE

PUBLICATION-DATE: September 19, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Manring, Noah	Columbia	MO	US	

APPL-NO: 09/ 811921 [PALM]
DATE FILED: March 19, 2001

INT-CL: [07] G06 F 19/00

US-CL-PUBLISHED: 701/50; 180/6.2
US-CL-CURRENT: 701/50; 180/6.2

REPRESENTATIVE-FIGURES: 3

ABSTRACT:

A method and apparatus for controlling straight line travel of a tracked machine having a left track and a right track. The method and apparatus includes initiating a straight line travel mode of the tracked machine, determining an initial heading angle of a heading sensor located on the tracked machine, sensing a deviation in heading angle from the initial heading angle as the tracked machine travels, determining a heading angle error in response to the deviation in heading angle, and adjusting the speed of at least one of the left and right tracks to compensate for the heading angle error.

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☐ 1. Document ID: US 5255651 A

Using default format because multiple data bases are involved.

L14: Entry 1 of 8 File: USPT Oct 26, 1993

US-PAT-NO: 5255651
DOCUMENT-IDENTIFIER: US 5255651 A

TITLE: Governor for fuel injection system

DATE-ISSUED: October 26, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wakasa; Satoshi	Oyama			JP
Okazaki; Toru	Oyama			JP

US-CL-CURRENT: 123/357; 123/198D, 123/385

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 2. Document ID: US 5121324 A

L14: Entry 2 of 8 File: USPT Jun 9, 1992

US-PAT-NO: 5121324
DOCUMENT-IDENTIFIER: US 5121324 A

TITLE: Motor vehicle magagement and control system including solenoid actuated fuel injection timing control

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 3. Document ID: US 5097803 A

L14: Entry 3 of 8 File: USPT Mar 24, 1992

US-PAT-NO: 5097803
DOCUMENT-IDENTIFIER: US 5097803 A

TITLE: Fuel supply and control system for compression ignition engines

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw De

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☐ 4. Document ID: US 4813233 A
L14: Entry 4 of 8 File: USPT Mar 21, 1989

US-PAT-NO: 4813233
DOCUMENT-IDENTIFIER: US 4813233 A

TITLE: Diesel particulate traps

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw De

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☐ 5. Document ID: US 4685291 A
L14: Entry 5 of 8 File: USPT Aug 11, 1987

US-PAT-NO: 4685291
DOCUMENT-IDENTIFIER: US 4685291 A

TITLE: Diesel particulate traps

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw De

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☐ 6. Document ID: US 4671059 A
L14: Entry 6 of 8 File: USPT Jun 9, 1987

US-PAT-NO: 4671059
DOCUMENT-IDENTIFIER: US 4671059 A

TITLE: Diesel particulate traps

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw De

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☐ 7. Document ID: US 4111169 A
L14: Entry 7 of 8 File: USPT Sep 5, 1978

US-PAT-NO: 4111169
DOCUMENT-IDENTIFIER: US 4111169 A

TITLE: Spark ignition internal combustion engines

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

☐ 8. Document ID: US 3263662 A

L14: Entry 8 of 8 File: USOC Aug 2, 1966

US-PAT-NO: 3263662
DOCUMENT-IDENTIFIER: US 3263662 A

TITLE: Limiting the fuel supply to an internal combustion engine

DATE-ISSUED: August 2, 1966

INVENTOR-NAME: WALTER BARTH; GUNTER JAHN ; ERWIN OSTER ; ALFONS HAGMANN

US-CL-CURRENT: 123/367, 123/365, 123/380

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De |

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Terms	Documents
L12 and (fuel$ with suppl$)	8

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L14: Entry 1 of 8 File: USPT Oct 26, 1993

DOCUMENT-IDENTIFIER: US 5255651 A
TITLE: Governor for fuel injection system

Abstract Text (1):
A hydraulic-controlled electronic governor employed in a fuel injection system is provided with a proportional pressure-reducing solenoid valve (10) capable of conducting a self-regulation of an input hydraulic pressure supplied from a hydraulic pressure source (30). Such pressure-reducing solenoid valve (10) is connected with a control rack (25) for controlling an amount of fuel injection, while interposed between the hydraulic pressure source (30) and a pressure input chamber (28) of a power piston/cylinder mechanism (22) for controlling the control rack (25), so that the input hydraulic force acting on one side of the piston (24) of the power piston/cylinder mechanism (22) balances the resilient force of a return spring (27) acting on the other side of such piston (24) so as to control the control rack (25) in its position.

Brief Summary Text (5):
Hitherto, in this type of the governor, a Bosch-type governor shown in FIG. 1 of the accompanying drawings is well known. In the Bosch-type governor, as shown in FIG. 1, a solenoid valve 1 is controlled to be turned on or off by a controller C, to cause a valve spool 2 to be operated, whereby a hydraulic pressure fed to a power piston/cylinder unit 3 is controlled. The thus controlled hydraulic pressure moves a control rack 4 to a position in which a resilient force of a return spring 5 balances a hydraulic force acting on a piston 3a of the power piston/cylinder unit 3. A rack position detecting sensor 6 detects such movement of the control rack 4 to issue a detecting signal to the controller C so as to constitute a feedback control for controlling the position of the control rack 4.

Brief Summary Text (6):
Incidentally, in addition to such detecting signal issued from the rack position detecting sensor 6, the controller C receives also other sensor's signals as to an inclination angle of an accelerator lever (not shown), an engine speed and the like. The reference numeral 7 denotes a gear pump which serves as a hydraulic pressure source.

Brief Summary Text (7):
In the above-mentioned conventional governor, in controlling a position of the control rack 4 for controlling an amount of fuel injection according to traveling conditions of a vehicle and loading conditions of the same, the rack position detecting sensor 6 constitutes an indispensable component of the governor, so that the governor does not function when some malfunction occurs in the sensor 6 itself or in a detecting signal transmitting path between the sensor 6 and the controller C.

Brief Summary Text (9):
The present invetion is made in consideration of the above problem inherent in the conventional governor, and, therefore, it is an object of the present invention to provide a governor employed in a fuel injection system, which governor makes it possible that the control rack is controlled by a provision of a proportional pressure-reducing solenoid valve even when some malfunction occurs in the rack

position detecting sensor or in the detecting signal transmitting path thereof, which solenoid valve is interposed between a pressure input chamber of a power piston/cylinder mechanism and a hydraulic pressure source and may be self-regulated in input-pressure.

Brief Summary Text (10):
In order to accomplish the above object of the present invention, according to the present invention, there is provided: a governor for a fuel injection system, comprising a proportional pressure-reducing solenoid valve which is interposed between a hydraulic pressure source and a pressure input chamber of a power piston/cylinder mechanism connected to a control rack for controlling an amount of fuel injection so as to control said control rack in operation, said proportional pressure-reducing solenoid valve being self-regulated in input pressure of a hydraulic pressure fed from said hydraulic pressure source to said pressure input chamber of said power piston/cylinder mechanism, whereby said control rack is controlled in its position by balancing a hydraulic pressure acting on one side of a piston of said power piston/cylinder mechanism against a resilient force of a return spring acting on the other side of said piston of said power piston/cylinder mechanism.

Detailed Description Text (7):
On the other hand, a movable element 33 of a rack position detecting sensor 32 is connected with the control rack 25 for issuing a detecting signal after detecting the movement of the control rack 25 by means of the rack position detecting sensor 32, which detecting signal is supplied to a controller C to constitute a feedback control. In the controller C are inputted various sensors' signals as to an inclination angle of an acceleration lever (not shown), an engine speed and the like.

Detailed Description Text (9):
Upon receipt of a signal issued from the rack position detecting sensor 32 and other various sensors' signals as to an inclination angle of an acceleration lever, an engine speed and the like, the controller C is operated to issue an output signal to the solenoid 20 so as to actuate the same 20, so that the movable element 21 of the solenoid 20 is moved, whereby the spool 18 of the proportional pressure-reducing solenoid valve 10, which spool 18 is connected with such movable element 21, is moved to cause the pump port 14 to communicate with the output port 15. As a result, a hydraulic pressure is supplied from the gear pump 30 to the pressure input chamber 28 of the power piston/cylinder mechanism 22, so that the control rack 25 is moved to a position in which a hydraulic force acting on the piston 24 balances the resilient force of the return spring 27. The rack position detecting sensor 32 detects such movement of the control rack 25 to issue a detecting signal to the controller C so as to constitute a feedback control.

Detailed Description Text (10):
In case that some malfunction occurs in the rack position detecting sensor 32 or the signal transmitting path thereof, since the hydraulic pressure received in the pressure input chamber 28 of the power piston/cylinder mechanism 22 acts on the pressure chamber 13 of the proportional pressure-reducing solenoid valve 10 through the passage 17, both of the hydraulic force developed in the pressure chamber 13 and the resilient force of the spring 19 form a leftward force acting on one end of the spool 18 to cause the spool 18 to move leftward in FIG. 2, while an electromagnetic force developed in the solenoid 20 forms a rightward force acting on the other end of the spool 18 through its movable element 21 so as to move the spool 18 rightward in FIG. 2, whereby the spool 18 is moved to a position in which the above-mentioned leftward force balances such rightward force, so that a hydraulic pressure proportional to such position is supplied to the power piston/cylinder mechanism 22. As a result, the control rack 25 is moved to a position in which such hydraulic pressure balances the resilient force of the return spring 27. Consequently, it is possible to control the control rack 25 even

if some malfunction occurs in the race position detecting sensor 32 or in its detecting signal transmitting path.

CLAIMS:

1. A governor control apparatus for a fuel injection system comprising:

a control rack by which movement an amount of fuel injection is controlled;

a power piston/cylinder mechanism connected to said control rack so as to control the movement of said rack and having a piston connected to said rack, a pressure input chamber on one side of said piston;

rack position detecting sensor producing a signal and being operatively associated with said control rack;

control means for controlling a supply of hydraulic fluid under pressure from a hydraulic pressure source to the pressure input chamber of said power piston/cylinder mechanism;

a controller receiving said signal from said rack position detecting sensor and connected to said control means for actuating the same according to said signal so as to control the position of said control rack by varying hydraulic pressure within said pressure input chamber; and

a proportional pressure control solenoid valve incorporated in said control means, interposed between said hydraulic pressure source and said pressure input chamber and being capable of conducting a self-regulation of an input hydraulic pressure applied to said pressure input chamber, said proportional pressure control solenoid valve being capable of independent said pressure control irrespective of said signal from said rack position sensor so that even when some malfunction occurs in said rack position detecting sensor or in the detecting signal transmitting path thereof, said control rack can be controlled by a provision of said proportional pressure control solenoid valve.

2. A fuel injection control system for a diesel engine for injecting a controlled amount of fuel for combustion in a combustion chamber, wherein a governor control apparatus comprising:

a primary fuel injection control system including

a fuel metering member movably disposed in said governor for adjusting flow rate of the fuel flowing therethrough for controlling injection amount of the fuel;

a hydraulic position control means associated with said fuel metering member for actuating the later to a position corresponding to a desired fuel injection amount which is determined on the basis of an engine output demand;

a sensor means for monitoring the position of said fuel metering member and producing a monitored position indicative signal;

an electrically controlled pressure supply control means for adjusting pressure supply for said hydraulic position control means according to an electric control signal supplied thereto;

a controller means for receiving said monitored position indicative signal for generating said control signal on the basis of said monitored position indicative signal and said engine output demand for positioning said fuel metering member at the position corresponding to a demanded fuel injection amount; and

an auxiliary control system incorporated in said electrically operable controlled pressure supple means and normally cooperated with said primary control system for controlling position of said fuel metering member to the position corresponding to the demanded fuel injection amount, and said auxiliary control system in response to failure of said primary control system for independently controlling the pressure supply for said hydraulic position control means for positioning said fuel metering member at a controlled position.

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☑ 1. Document ID: US 5255651 A

Using default format because multiple data bases are involved.

L14: Entry 1 of 8 File: USPT Oct 26, 1993

US-PAT-NO: 5255651
DOCUMENT-IDENTIFIER: US 5255651 A

TITLE: Governor for fuel injection system

DATE-ISSUED: October 26, 1993

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Wakasa; Satoshi	Oyama			JP
Okazaki; Toru	Oyama			JP

US-CL-CURRENT: 123/357; 123/198D, 123/385

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 2. Document ID: US 5121324 A

L14: Entry 2 of 8 File: USPT Jun 9, 1992

US-PAT-NO: 5121324
DOCUMENT-IDENTIFIER: US 5121324 A

TITLE: Motor vehicle magagement and control system including solenoid actuated fuel injection timing control

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

☐ 3. Document ID: US 5097803 A

L14: Entry 3 of 8 File: USPT Mar 24, 1992

US-PAT-NO: 5097803
DOCUMENT-IDENTIFIER: US 5097803 A

TITLE: Fuel supply and control system for compression ignition engines

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw De

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☐ 4. Document ID: US 4813233 A
L14: Entry 4 of 8 File: USPT Mar 21, 1989

US-PAT-NO: 4813233
DOCUMENT-IDENTIFIER: US 4813233 A

TITLE: Diesel particulate traps

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw De

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☐ 5. Document ID: US 4685291 A
L14: Entry 5 of 8 File: USPT Aug 11, 1987

US-PAT-NO: 4685291
DOCUMENT-IDENTIFIER: US 4685291 A

TITLE: Diesel particulate traps

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw De

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☐ 6. Document ID: US 4671059 A
L14: Entry 6 of 8 File: USPT Jun 9, 1987

US-PAT-NO: 4671059
DOCUMENT-IDENTIFIER: US 4671059 A

TITLE: Diesel particulate traps

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw De

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☐ 7. Document ID: US 4111169 A
L14: Entry 7 of 8 File: USPT Sep 5, 1978

US-PAT-NO: 4111169
DOCUMENT-IDENTIFIER: US 4111169 A

TITLE: Spark ignition internal combustion engines

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw De

☐ 8. Document ID: US 3263662 A

L14: Entry 8 of 8 File: USOC Aug 2, 1966

US-PAT-NO: 3263662
DOCUMENT-IDENTIFIER: US 3263662 A

TITLE: Limiting the fuel supply to an internal combustion engine

DATE-ISSUED: August 2, 1966

INVENTOR-NAME: WALTER BARTH; GUNTER JAHN ; ERWIN OSTER ; ALFONS HAGMANN

US-CL-CURRENT: 123/367, 123/365, 123/380

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw De

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Terms	Documents
L12 and (fuel$ with suppl$)	8

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L11: Entry 1 of 1 File: USPT Sep 23, 1997

DOCUMENT-IDENTIFIER: US 5670830 A
TITLE: Fuel use limiter-equipped hybrid electric car

Abstract Text (1):
A fuel use limiter-equipped hybrid electric car has a battery unit chargeable by an external charger, an electric drive motor capable of driving wheels by electric power from the battery unit, an internal combustion engine for driving a generator to supply electric power to the electric drive motor, and a controller for controlling operations of the electric drive motor and internal combustion engine. The hybrid electric car is further provided with a fuel-use-state detector for detecting a change in a parameter, which change corresponds to a quantity of fuel used by the internal combustion engine since charging of the battery unit by the external charger. The controller limits at least one of an output of the electric drive motor and that of internal combustion engine when from results of a detection by the fuel-use-state detector, the change in the parameter is found to have reached a predetermined value.

Brief Summary Text (3):
This invention relates to a hybrid electric car of the type--for example, a series hybrid electric car equipped with an internal combustion engine for driving a generator to produce electric power for an electric drive motor, or a parallel hybrid electric car equipped with an internal combustion engine for directly driving wheels, equipped with a fuel use limiter in which reduction in the dependency on the internal combustion engine has been taken into consideration.

Brief Summary Text (23):
With the foregoing problems in view, the present invention has as a primary object thereof the provision of a fuel use limiter-equipped hybrid electric car which can lead a driver to running without relying upon an internal combustion engine.

Brief Summary Text (24):
In a first aspect of the present invention, there is thus provided a fuel use limiter-equipped hybrid electric car having a battery unit chargeable by external charging means, an electric drive motor capable of driving wheels by electric power from the battery unit, an internal combustion engine for driving a generator to supply electric power to the electric drive motor, and control means for controlling operations of the electric drive motor and the internal combustion engine, comprising:

Brief Summary Text (26):
wherein the control means limits at least one of an output of the electric drive motor and that of the internal combustion engine when from results of a detection by the fuel-use-state detection means, the change in the parameter is found to have reached a predetermined value.

Brief Summary Text (27):
In the fuel use limiter-equipped hybrid electric car according to the first aspect of the present invention, electric power supplied from the battery unit under the

control of the control means operates the electric drive motor to drive the wheels. Although this battery unit can be charged by the external charging means when its remaining capacity of this battery unit has dropped, the internal combustion engine is operated when the remaining capacity of the battery unit has dropped or so. While supplying a portion of the electric power, which has been produced by the generator, to the electric drive motor, the wheels can be driven by the remaining portion of the electric power.

Brief Summary Text (28):
However, when the fuel-use-state detection means detects a change in the parameter, the change corresponding to a quantity of fuel which has been used by the internal combustion engine since charging of the battery unit by the external charging means, and the change in the parameter is found to have reached a predetermined value, the control means limits at least one of an output of the electric drive motor and that of the internal engine. In other words, when running is continued without external charging while using fuel by the internal combustion engine, the output of the electric drive motor or that of the internal combustion engine is limited at the stage that the amount of used fuel has reached a certain level, whereby the driver is urged to perform external charging.

Brief Summary Text (30):
The fuel use limiter-equipped hybrid electric car according to the first aspect of the present invention can include the following embodiments:

Brief Summary Text (31):
(a) In the first aspect, the quantity of supplied fuel is used as the parameter, the fuel-use-state detection means is supplied-fuel-quantity detection means for detecting a total quantity of fuel supplied after the charging of the battery unit by the external charging means, and the control means limits the output of the electric drive motor when from the results of the detection by the fuel-use-state detection means, the total quantity of supplied fuel is found to have reached a predetermined value.

Brief Summary Text (38):
(h) In the embodiment (b), the hybrid electric car is provided with means for detecting a trouble of a path through which detection results are transmitted from the fuel detection means to the supplied-fuel-quantity detection means, and the control means limits an output of the electric drive motor upon detection of a trouble by the trouble detection means irrespective of results of a detection by the supplied-fuel-quantity detection means.

Brief Summary Text (39):
(i) In the first aspect, the hybrid electric car is provided with means for detecting a quantity of fuel in the fuel tank, the quantity of fuel in the fuel tank is used as the parameter, the fuel-use-state detection means comprises consumed-fuel-quantity detection means for detecting on the basis of detection information from the fuel quantity detection means a total quantity of fuel consumed after charging of the battery unit by the external charging means, and the control means limits an output of the electric drive motor when from results of a detection by the consumed-fuel-quantity detection means, the total quantity of consumed fuel is found to have reached a predetermined value.

Brief Summary Text (41):
(k) In the embodiment (i), the hybrid electric car is provided with means for detecting a trouble of a path through which detection results are transmitted from the fuel detection means to the supplied-fuel-quantity detection means, and the control means limits an output of the electric drive motor upon detection of a trouble by the trouble detection means irrespective of results of a detection by the supplied-fuel-quantity detection means.

Brief Summary Text (42):
(l) In the embodiment (j), the hybrid electric car is provided with means for detecting a trouble of a path through which detection results are transmitted from the fuel detection means to the supplied-fuel-quantity detection means, and the control means limits an output of the electric drive motor upon detection of a trouble by the trouble detection means irrespective of results of a detection by the supplied-fuel-quantity detection means.

Brief Summary Text (43):
(m) In the first aspect, a travelled distance of the car while using the internal combustion engine is used as the parameter, the fuel-use-state detection means comprises travelled distance detection means for detecting a total distance travelled during the use of the internal combustion engine after charging of the battery unit by the external charging means, and the control means limits an output of the electric drive motor when, from results of a detection by the travelled distance detection means, the total distance travelled during the use of the internal combustion engine is found to have reached a predetermined value.

Brief Summary Text (46):
(p) In first aspect, a travelled distance of the car while using the internal combustion engine is used as the parameter, the fuel-use-state detection means comprises travelled distance detection means for detecting a total distance travelled during the use of the internal combustion engine after charging of the battery unit by the external charging means, and the control means limits an output of the electric drive motor when from results of a detection by the travelled distance detection means, the total distance travelled during the use of the internal combustion engine is found to have reached a predetermined value or when, from results of a detection by said travelled distance detection means, the total distance travelled during the use of the internal combustion engine is found to have reached another predetermined value.

Brief Summary Text (47):
(q) In the embodiment (p), the hybrid electric car is provided with means for detecting a trouble of a path through which detection results are transmitted from the fuel detection means to the supplied-fuel-quantity detection means, and the control means limits an output of the electric drive motor upon detection of a trouble by the trouble detection means irrespective of results of a detection by the supplied-fuel-quantity detection means.

Brief Summary Text (49):
(s) In the first aspect, an operation time of the internal combustion engine is used as the parameter, the fuel-use-state detection means comprises operation time detection means for detecting an operation time of the internal combustion engine after charging of the battery unit by the external charging means, and the control means limits an output of the electric drive motor when from results of a detection by the operation time detection means, the operation time of the internal combustion engine is found to have reached a predetermined value.

Brief Summary Text (57):
In a second aspect of the present invention, there is also provided a fuel use limiter-equipped hybrid electric car having a battery unit chargeable by external charging means, an electric drive motor capable of driving wheels by electric power from the battery unit, an internal combustion engine capable of driving the drive wheels, and control means for controlling operations of said electric drive motor and said internal combustion engine, comprising:

Brief Summary Text (59):
wherein the control means limits an output of the internal combustion engine when from results of a detection by said fuel-use-state detection means, the change in the parameter is found to have reached a predetermined value.

Brief Summary Text (60):
In the fuel use limiter-equipped hybrid electric car according to the second aspect of the present invention, electric power supplied from the battery unit under the control of the control means operates the electric drive motor to drive the wheels. Although this battery unit can be charged by the external charging means when its remaining capacity of this battery unit has dropped, the internal combustion engine is operated when the remaining capacity of the battery unit has dropped or so. The drive wheels can, therefore, be driven directly by the internal combustion engine.

Brief Summary Text (61):
However, when the fuel-use-state detection means detects a change in the parameter, the change corresponding to a quantity of fuel which has been used by the internal combustion engine since charging of the battery unit by the external charging means, and the change in the parameter is found to have reached a predetermined value, the control means limits an output of the internal engine. In other words, when running is continued without external charging while using fuel by the internal combustion engine, the output of the internal combustion engine is limited at the stage that the amount of used fuel has reached a certain level, whereby the driver is urged to perform external charging.

Drawing Description Text (2):
FIG. 1 is a simplified block diagram showing an essential construction of a fuel use limiter-equipped hybrid electric car according to a first embodiment of the present invention;

Drawing Description Text (3):
FIG. 2 is a diagram illustrating a specific example of output limiting characteristics of the fuel use limiter-equipped hybrid electric car according to the first embodiment of the present invention;

Drawing Description Text (4):
FIG. 3 is a diagram illustrating another specific example of the output limiting characteristics of the fuel use limiter-equipped hybrid electric car according to the first embodiment of the present invention;

Drawing Description Text (5):
FIG. 4 is a flow chart illustrating an operation of the fuel use limiter-equipped hybrid electric car according to the first embodiment of the present invention;

Drawing Description Text (6):
FIG. 5 is a flow chart illustrating an operation of a modification of the fuel use limiter-equipped hybrid electric car according to the first embodiment of the present invention;

Drawing Description Text (7):
FIG. 6 is a simplified block diagram showing an essential construction of a fuel use limiter-equipped hybrid electric car according to a second embodiment of the present invention;

Drawing Description Text (8):
FIG. 7 is a flow chart illustrating an operation of the fuel use limiter-equipped hybrid electric car according to the second embodiment of the present invention;

Drawing Description Text (9):
FIG. 8 is a simplified block diagram showing an essential construction of a fuel use limiter-equipped hybrid electric car according to a third embodiment of the present invention;

Drawing Description Text (10):

FIG. 9 is a flow chart illustrating an operation of the fuel use limiter-equipped hybrid electric car according to the third embodiment of the present invention;

Detailed Description Text (2):
Referring first to FIGS. 1 through 4, the fuel use limiter-equipped hybrid electric car according to the first embodiment of the present invention will hereinafter be described. FIG. 1 schematically illustrates the construction of its essential part. In this embodiment, the present invention has been applied to a series hybrid electric car.

Detailed Description Text (10):
The drive management controller 9 generally performs control of the motor controller 4, the generator 6 and the engine 7 on the basis of information on a driver's command such as an accelerator pedal stroke and also remaining battery unit capacity information from the remaining capacity meter 11. In addition, based on detection information from the remaining capacity meter 11, the fuel gauge 12 and the filler cap open/close sensor 16, the drive management controller 9 calculates the total quantity of fuel which has been supplied since the battery unit was externally charged. When this total quantity of supplied fuel has exceeded a predetermined value set in advance, the drive management controller 9 limits an output of the electric drive motor 2.

Detailed Description Text (14):
When the value of the total quantity of fuel supplied since the external charging of the battery unit, as calculated above, has exceeded a predetermined value, the drive management controller 9 limits an output of the electric drive motor 2. When the battery unit is externally charged again, the drive management controller 9 cancels the limitation of the output. In addition, when the total quantity of supplied fuel has exceeded the predetermined value, the drive management controller 9 also turns on an alarm lamp 17 to indicate an oversupply of fuel. This limitation of the output of the electric drive motor 2 is set at such a level that, although the driver fully perceives an insufficient output of the car, the driver can barely reach a place where external charging can be performed.

Detailed Description Text (16):
The fuel use limiter-equipped hybrid electric car according to the first embodiment of the present invention is also provided with wire breaking detection means 18A which detects any breaking of a signal line 12A from the fuel gauge 12. When breaking of the signal line 12A is determined based on detection information from the wire breaking detection means 18A, the drive management controller 9 limits the output of the electric drive motor 2 irrespective of the value of the total quantity of supplied fuel. When the signal line 12A is restored (i.e., connected) again by repair or the like, the drive management controller 9 then cancel the limitation of the output of the electric drive motor 2.

Detailed Description Text (17):
In the fuel use limiter-equipped hybrid electric car according to the first embodiment of the present invention, control is performed for the limitation of use of fuel, for example, as shown in FIG. 4 owing to the above-described construction.

Detailed Description Text (18):
Namely, based on information from the wire breaking detection means 18A, the drive management controller 9 first determines whether breaking of the signal line 12A of the fuel gauge 12 (fuel wire gauge breaking) has been detected or not (step A1). If breaking of the fuel gauge wire is detected, an output of the electric drive motor 2 is limited (step A2).

Detailed Description Text (20):
Further, it is determined whether or not this total quantity of supplied fuel has

reached a preset value determined in advance (step A7). If the total quantity of supplied fuel is determined to have reached the preset value, an output of the electric drive motor 2 is limited (step A8) and the alarm lamp 17 is turned on to indicate an oversupply of fuel (step A9).

Detailed Description Text (23):
If the total quantity of supplied fuel is not determined to have reached the preset value, on the other hand, the routine then advances to step A13 without limiting the output of the electric drive motor 2. Based on information on the remaining capacity of the battery unit from the remaining capacity meter 11, it is determined whether the battery unit has been subjected to external charging or not. If external charging is determined to have been applied to the battery unit, the value of the total quantity of supplied fuel is reset (step A14). Namely, the quantity of fuel at the time point that the external charging of the battery unit has been determined is set as an initial value of the total quantity of supplied fuel, and the routine then advances to step A12. If the battery unit is not determined in step A13 to have been externally charged, the routine advances directly to step A12 without going through step A14. Consequently, whichever the case may be (namely, whichever route is taken from step A13), the routine advances to step A12 so that the limitation of the output of the electric drive motor 2 is canceled.

Detailed Description Text (24):
Where the routine has advanced through the route of step A13 and step A14, no output limitation has been performed in general. In this case, step A12 is not needed. Where breaking of the fuel gauge wire has been restored, an output limitation may, however, be performed even when the routine advances through step A13 and step A14. In this case, the limitation of the output of the electric drive motor 2 is canceled.

Detailed Description Text (25):
If the quantity of supplied fuel (strictly speaking, the quantity of consumable fuel) increases without external charging as described above, a limitation is imposed on the output of the electric drive motor 2. The driver therefore perceives an insufficient output of the car so that the driver is urged to perform external charging. Further, the lighting of the alarm lamp 17, which indicates an oversupply of fuel, gives a warning to the driver so that the driver can recognize this reduction in the output as being attributed to the oversupply of fuel instead of any trouble.

Detailed Description Text (28):
Here, a description will be made of a modification of the first embodiment. This modification is basically similar to the first embodiment except that the timing of lighting of the alarm lamp 17 is different. In the first embodiment, the output limitation of the electric drive motor 2 and the lighting of the alarm lamp 17 are performed at the same time when the total quantity of supplied fuel has exceeded the preset value. However, this modification is constructed so that the alarm lamp is turned on when the total quantity of supplied fuel has exceeded a first preset value and the output of the electric drive motor 2 is subsequently limited when the total quantity of supplied fuel has exceeded a second preset value set at a value greater than the first preset value.

Detailed Description Text (29):
A specific example of control for the limitation of use of fuel will next be described with reference to FIG. 5.

Detailed Description Text (30):
Steps A1-A6 are exactly the same as steps A1-A6 in the first embodiment. When the total quantity of supplied fuel has been calculated in step A6, it is next determined whether or not this total quantity of supplied fuel has reached a preset first value determined in advance (step A20). If the total quantity of supplied

fuel is determined to have reached the first preset value, the alarm lamp 17 is turned on (step A21). Based on information on the remaining capacity of the battery unit from the remaining capacity meter 11, it is next determined whether or not the battery unit has been externally charged (step A22). If the battery unit is not determined to have been subjected to external charging, it is determined whether the total quantity of supplied fuel has reached the second preset value determined beforehand at the value greater than the first set value (step A23). If the total quantity of supplied fuel is determined to have reached the second preset value, an output limitation of the electric drive motor 2 is performed (step A24).

Detailed Description Text (34):
When external charging is performed while the alarm lamp 17 is being lit to indicate an oversupply of fuel, in other words, while the total quantity of fuel supplied without external charging is between the first preset value and the second preset value, the value of the total quantity of supplied fuel is also reset (step A26). When external charging is performed while the alarm lamp 17 is being lit and the output of the electric drive motor 2 is limited, in other words, when the total quantity of fuel supplied without external charging has exceeded the second preset value, the value of the total quantity of supplied fuel is also reset (step A27). In each of these steps A14, A26 and A27, it is no longer necessary to perform external charging and hence to limit the output of the electric drive motor 2, the output limitation of the electric drive motor 2 is canceled or the alarm lamp 17 is turned off (step A12).

Detailed Description Text (35):
Where the routine has advanced through the route of step A13 and step A14, no output limitation has been performed in general. In this case, step A12 is not needed. Where breaking of the fuel gauge wire has been restored, an output limitation may, however, be performed even when the routine advances through step A13 and step A14. In this case, the limitation of the output of the electric drive motor 2 is canceled.

Detailed Description Text (36):
If the quantity of supplied fuel, namely, the quantity of consumable fuel increases without external charging, a limitation is eventually imposed on the output of the electric drive motor 2 as in the first embodiment described above. The driver, therefore, perceives an insufficient output of the car so that the driver is urged to perform external charging. In this modification, it is to be noted especially that the alarm lamp 17 is turned on at a stage before the output limitation of the electric drive motor 2 is performed. The driver can, therefore, learn that the output will be limited eventually if he continues to drive the car further without external charging. This makes it possible to perform external charging before the output limitation is performed.

Detailed Description Text (38):
Referring next to FIGS. 6 and 7, the fuel use limiter-equipped hybrid electric car according to the second embodiment of the present invention will hereinafter be described. FIG. 6 schematically illustrates the construction of its essential part. In this embodiment, the present invention has been applied to a series hybrid electric car although not shown in FIG. 6.

Detailed Description Text (43):
The fuel use limiter-equipped hybrid electric car according to the second embodiment of the present invention is also provided with wire breaking detection means 18B which detects any breaking of a signal line 19A from the wheel speed sensor 19. When breaking of the signal line 19A is determined based on detection information from the wire breaking detection means 18B, the drive management controller 9 limits the output of the electric drive motor 2 irrespective of the value of the travelled distance. When the signal line 19A is restored (i.e., connected) again by repair or the like, the drive management controller 9 then

cancels the limitation of the output of the electric drive motor 2.

Detailed Description Text (44):
In the fuel use limiter-equipped hybrid electric car according to the second embodiment of the present invention, control is performed for the limitation of use of fuel, for example, as shown in FIG. 7 owing to the above-described construction.

Detailed Description Text (50):
If the quantity of supplied fuel (strictly speaking, the quantity of consumable fuel) increases without external charging as described above, a limitation is imposed on the output of the electric drive motor 2. The driver therefore perceives an insufficient output of the car so that the driver is urged to perform external charging. Further, the display of the coverable distance gives a warning to the driver so that the driver can recognize this reduction in the output as being attributed to excessive power-generating running instead of any trouble.

Detailed Description Text (53):
Referring next to FIGS. 8 and 9, the fuel use limiter-equipped hybrid electric car according to the third embodiment of the present invention will hereinafter be described. FIG. 8 schematically illustrates the construction of its essential part. In this embodiment, the present invention has been applied to a series hybrid electric car although not shown in FIG. 8.

Detailed Description Text (54):
This embodiment is a combination of the first embodiment and the second embodiment. In FIG. 8, like reference numerals to those shown in FIGS. 1 and 6 indicate like elements of structure. As these elements have already been described above, their description is omitted here to avoid unnecessary repetition. Based on detection information from a remaining capacity meter 11, a fuel gauge 12 and a filler cap open/close sensor 16, a drive management controller 9 in this embodiment calculates a total quantity of fuel supplied since external charging of the battery unit. When this total quantity of supplied fuel has exceeded a preset value determined in advance, a limitation is imposed on an output of an electric drive motor 2. Further, based on detection information from the remaining capacity meter 11 and the wheel speed sensor 19, the battery unit is externally charged and a distance (running distance) travelled by power-generating running subsequent to the external charging of the battery unit is calculated. When this travelled distance exceeds a preset value determined in advance, the output of the electric drive motor 2 is limited.

Detailed Description Text (55):
Namely, the drive management controller 9 limits the output of the electric drive motor 2 when the total quantity of supplied fuel (the quantity of consumable fuel) has reached the preset value without external charging of the battery unit or the travelled distance has exceeded the preset value without external charging of the battery unit.

Detailed Description Text (56):
In the fuel use limiter-equipped hybrid electric car according to the third embodiment of the present invention, control is performed for the limitation of use of fuel, for example, as shown in FIG. 9 owing to the above-described construction.

Detailed Description Text (57):
Namely, based on information from the wire breaking detection means 18A, the drive management controller 9 first determines whether breaking of the signal line 12A of the fuel gauge 12 (fuel wire gauge breaking) has been detected or not (step C1). If breaking of the fuel gauge wire is detected, an output of the electric drive motor 2 is limited (step C2).

Detailed Description Text (59):
Further, it is determined whether or not this total quantity of supplied fuel has reached a preset value determined in advance (step C7). If the total quantity of supplied fuel is determined to have reached the preset value, an output of the electric drive motor 2 is limited (step C8) and an alarm lamp 17 is turned on to indicate an oversupply of fuel (step C9).

Detailed Description Text (61):
If the total quantity of supplied fuel is not determined to have reached the preset value, on the other hand, the routine then advances to step C12 without limiting the output of the electric drive motor 2. Based on information on the remaining capacity of the battery unit from the remaining capacity meter 11, it is determined whether the battery unit has been subjected to external charging or not. If external charging is determined to have been applied to the battery unit, the value of the total quantity of supplied fuel is reset (step C13). Namely, the quantity of fuel at the time point that the external charging of the battery unit has been determined is set as an initial value of the total quantity of supplied fuel.

Detailed Description Text (67):
Where the routine has advanced through the route of step C24 and step C25, no output limitation has been performed in general. In this case, step C22 is not needed. Where breaking of the fuel gauge wire has been restored, an output limitation may, however be performed even when the routine advances through step C24 and step C25. In this case, the limitation of the output of the electric drive motor 2 is canceled.

Detailed Description Text (68):
If the quantity of supplied fuel (strictly speaking, the quantity of consumable fuel) increases without external charging as described above, a limitation is imposed on the output of the electric drive motor 2. The driver therefore perceives an insufficient output of the car so that the driver is urged to perform external charging. Further, the display of the coverable distance gives a warning to the driver so that the driver can recognize this reduction in the output as being attributed to excessive power-generating running instead of any trouble. In particular, the third embodiment uses the two parameters, that is, the total quantity of supplied fuel (the amount of consumable fuel) and the travelled distance as parameters corresponding to the quantity of used fuel, so that excessive power-generating running is strictly checked.

Detailed Description Text (71):
It is to be noted that parameters corresponding to the quantity of used fuel are not limited to such total quantity of supplied fuel, travelled distance and the like. Insofar as a parameter corresponding to the quantity of used fuel, for example, the time of power-generating running, the time of operation of the internal combustion engine or the like is used, detection of a change in such a parameter makes it possible to detect the state of use of fuel so that overuse of the internal combustion engine can be detected.

Detailed Description Text (72):
The modification of the first embodiment is constructed so that the alarm lamp is turned on when the total quantity of supplied fuel has exceeded the first preset value and the output of the electric drive motor 2 is subsequently limited when the total quantity of supplied fuel has exceeded the second preset value set at a value greater than the first preset value. Similar modifications can also be practiced with respect to the second embodiment and the third embodiment.

Detailed Description Text (74):
In the case of the third embodiment, such a modification can be obtained by constructing it in such a way that the alarm lamp is lit when the total quantity of

supplied fuel has exceeded the first set value or the travelled distance has exceeded the first set value and the output of the electric drive motor 2 is limited when the total quantity of supplied fuel has exceeded the second set value set at the value greater than the first set value or the travelled distance has exceeded the second set value set at the value greater than the first set value.

CLAIMS:

1. A fuel use limiter-equipped hybrid electric car having a battery unit chargeable by external charging means, an electric drive motor for driving wheels by electric power from said battery unit, an internal combustion engine for driving a generator to supply electric power to said electric drive motor, and control means for controlling operations of said electric drive motor and said internal combustion engine, comprising:

fuel-use-state detection means for detecting a change in a parameter, said change corresponding to a quantity of fuel which has been used by said internal combustion engine since charging of said battery unit by said external charging means,

wherein said control means limits at least one of an output of said electric drive motor and an output of said internal combustion engine when from results of a detection by said fuel-use-state detection means, said change in said parameter reaches a predetermined value.

2. A fuel use limiter-equipped hybrid electric car according to claim 1, wherein a quantity of supplied fuel is used as said parameter, said fuel-use-state detection means includes supplied-fuel-quantity detection means for detecting a total quantity of fuel supplied after said charging of said battery unit by said external charging means, and said control means limits the output of said electric drive motor when from the results of detection by said fuel-use-state detection means, said total quantity of supplied fuel reaches a predetermined value.

3. A fuel use limiter-equipped hybrid electric car according to claim 2, further comprising:

fuel quantity detection means for detecting a quantity of fuel in a fuel tank, wherein

said supplied-fuel-quantity detection means detects the total quantity of the supplied fuel on the basis of detection information from said fuel quantity detection means.

4. A fuel use limiter-equipped hybrid electric car according to claim 2, wherein said supplied-fuel-quantity detection means calculates the total quantity of the supplied fuel by using, as an initial value of the total quantity of supplied fuel, a quantity of fuel immediately after charging of said battery unit by said external charging means and then adding a quantity of fuel supplied at each fuel filling.

5. A fuel use limiter-equipped hybrid electric car according to claim 3, further comprising:

filler cap open/close detection means for detecting an opened or closed state of a filler cap, wherein

said supplied-fuel-quantity detection means calculates the quantity of fuel supplied at each fuel filling from a quantity of fuel in said fuel tank detected upon opening of said filler cap and another quantity of fuel in said fuel tank detected upon subsequent closure of the filler cap on the basis of detection information from said filler cap open/close detection means and detection information from said fuel quantity detection means.

6. A fuel use limiter-equipped hybrid electric car according to claim 3, further comprising:

means for detecting a trouble of a path through which detection results are transmitted from said fuel quantity detection means to said supplied-fuel-quantity detection means, wherein said control means limits the output of said electric drive motor upon detection of a trouble by said trouble detection means irrespective of results of a detection by said supplied-fuel-quantity detection means.

7. A fuel use limiter-equipped hybrid electric car according to claim 1, further comprising:

fuel quantity detection means for detecting a quantity of fuel in said fuel tank, wherein

the quantity of fuel in said fuel tank is used as the parameter, said fuel-use-state detection means includes consumed-fuel-quantity detection means for detecting on the basis of detection information from said fuel quantity detection means a total quantity of fuel consumed after charging of said battery unit by said external charging means, and said control means limits an output of said electric drive motor when from results of a detection by said consumed-fuel-quantity detection means, the total quantity of consumed fuel reaches a predetermined value.

8. A fuel use limiter-equipped hybrid electric car according to claim 7, wherein said consumed-fuel-quantity detection means calculates the total quantity of consumed fuel by subtracting a quantity of fuel after each running of said car from a quantity of fuel before the running to determine the quantity of fuel consumed during the running and summing quantities of fuel consumed during individual runnings.

9. A fuel use limiter-equipped hybrid electric car according to claim 7, further comprising:

trouble detection means for detecting a trouble of a path through which detection results are transmitted from said fuel quantity detection means to said supplied-fuel-quantity detection means, wherein

said control means limits an output of said electric drive motor upon detection of a trouble by said trouble detection means irrespective of results of a detection by said supplied-fuel-quantity detection means.

10. A fuel use limiter-equipped hybrid electric car according to claim 1, wherein a travelled distance of said car while using said internal combustion engine is used as the parameter, said fuel-use-state detection means includes travelled distance detection means for detecting a total distance travelled during the use of said internal combustion engine after charging of said battery unit by said external charging means, and said control means limits the output of said electric drive motor when from results of a detection by said travelled distance detection means, the total distance travelled during the use of said internal combustion engine reaches a predetermined value.

11. A fuel use limiter-equipped hybrid electric car according to claim 10, wherein said travelled distance detection means detects the total travelled distance during the use of said internal combustion engine on the basis of information on use of said internal combustion engine and detection information from wheel speed detection means which said car is equipped with.

12. A fuel use limiter-equipped hybrid electric car according to claim 11, further comprising:

trouble detection means for detecting a trouble of a path through which detection results are transmitted from said wheel speed detection means to said travelled distance detection means,. wherein

said control means limits an output of said electric drive motor upon detection of a trouble by said trouble detection means irrespective of results of a detection by said wheel speed detection means.

13. A fuel use limiter-equipped hybrid electric car according to claim 1, wherein a quantity of supplied fuel or a travelled distance of said car while using said internal combustion engine is used as the parameter, said fuel-use-state detection means includes supplied-fuel-quantity detection means for detecting a total quantity of fuel supplied after said charging of said battery unit by said external charging means and travelled distance detection means for detecting a total distance travelled during said using of said internal combustion engine after charging of said battery unit by said external charging means, and said control means limits an output of said electric drive motor when from results of a detection by said supplied-fuel-quantity detection means, said total quantity of fuel supplied after said charging of said battery unit by said external charging means reaches a predetermined value or when from results of a detection by said travelled distance detection means, said total distance travelled during said using of said internal combustion engine reaches another predetermined value.

14. A fuel use limiter-equipped hybrid electric car according to claim 1, wherein an operation time of said internal combustion engine is used as the parameter, said fuel-use-state detection means includes operation time detection means for detecting an operation time of said internal combustion engine after charging of said battery unit by said external charging means, and said control means limits the output of said electric drive motor when from results of a detection by said operation time detection means, the operation time of said internal combustion engine reaches a predetermined value.

15. A fuel use limiter-equipped hybrid electric car according to claim 14, wherein said operation time detection means detects the operation time of said internal combustion engine by a timer on the basis of information on use of said internal combustion engine.

16. A fuel use limiter-equipped hybrid electric car according to claim 1, further comprising:

warning means which is actuated when from results of a detection by said fuel-use-state detection means, said change in said parameter reaches a predetermined value.

17. A fuel use limiter-equipped hybrid electric car according to claim 16, wherein the predetermined value of the change of the parameter, at which predetermined value said warning means is actuated, is set smaller than another predetermined value of the change of the parameter at said another predetermined value the output of said electric drive motor is limited.

18. A fuel use limiter-equipped hybrid electric car according to claim 1, wherein said control means limits the output of said electric drive motor when the change in the parameter reaches the predetermined value.

19. A fuel use limiter-equipped hybrid electric car according to claim 18, wherein said control means operates said internal combustion engine in an operation region in which gas mileage and exhaust gas are optimal.

20. A fuel use limiter-equipped hybrid electric car according to claim 18, wherein said control means limits the output of said electric drive motor by limiting a maximum torque of said electric drive motor.

21. A fuel use limiter-equipped hybrid electric car according to claim 1, wherein said control means limits the output of said electric drive motor by gradually reducing a torque of said electric drive motor when a rotational speed of said electric drive motor reaches a predetermined value.

22. A fuel use limiter-equipped hybrid electric car having a battery unit chargeable by external charging means, an electric drive motor for driving wheels by electric power from said battery unit, an internal combustion engine for driving said wheels, and control means for controlling operations of said electric drive motor and said internal combustion engine, comprising:

fuel-use-state detection means for detecting a change in a parameter, said change corresponding to a quantity of fuel which has been used by said internal combustion engine since charging of said battery unit by said external charging means,

wherein said control means limits at least one of an output of said electric drive motor and an output of said internal combustion engine when from results of a detection by said fuel-use-state detections means, said change in said parameter reaches a predetermined value.

23. A fuel use limiter-equipped hybrid electric car according to claim 22, further comprising:

fuel quantity detection means for detecting a quantity of fuel in said fuel tank, wherein

the quantity of fuel in said fuel tank is used as the parameter, said fuel-use-state detection means includes consumed-fuel-quantity detection means for detecting on the basis of detection information from said fuel quantity detection means a total quantity of fuel consumed after charging of said battery unit by said external charging means, and said control means limits said output of at least one of said electric drive motor and said internal combustion engine when from results of a detection by said consumed fuel reaches a predetermined value.

24. A fuel use limiter-equipped hybrid electric car according to claim 22, wherein a quantity of supplied fuel is used as said parameter, said fuel-use-state detection means includes supplied-fuel-quantity detection means for detecting a total quantity of fuel supplied after said charging of said battery unit by said external charging means, and said control means limits said output of at least one of said electric drive motor and said internal combustion engine when from results of said detection by said fuel-use-state detection means, said total quantity of supplied fuel reaches a predetermined value.

25. A fuel use limiter-equipped hybrid electric car according to claim 22, wherein a travelled distance of said car while using said internal combustion engine is used as the parameter, said fuel-use-state detection means includes travelled distance detection means for detecting a total distance travelled during said using of said internal combustion engine after charging of said battery unit by said external charging means, and said control means limits said output of at least one of said electric drive motor and said internal combustion engine when from results of a detection by said travelled distance detection means, the total distance travelled during said using of said internal combustion engine reaches a predetermined value.

26. A fuel use limiter-equipped hybrid electric car according to claim 22, wherein

a operation time of said internal combustion engine is used as the parameter, said fuel-use-state detection means includes operation time detection means for detecting an operation time of said internal combustion engine after charging of said battery unit by said external charging means, and said control means limits said output of at least one of said electric drive motor and said internal combustion engine when from results of a detection by said operation time detection means, the operation time of said internal combustion engine reaches a predetermined value.

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L13: Entry 1 of 1 File: USPT Mar 24, 1992

DOCUMENT-IDENTIFIER: US 5097803 A
TITLE: Fuel supply and control system for compression ignition engines

Brief Summary Text (4):
These proposals have been made for the employment of gases and liquid alcohol fuels as alternatives for spark ignition internal combustion engines and compression ignition or `diesel` engines; and while considerable success has been achieved with the employment of gaseous and liquid alcohol fuels as alternative fuels for spark ignition engines, and success to a lesser degree has been achieved with the gas conversion of diesel engines, proposals for operating diesel engines on a liquid alcohol fuel have not achieved the same degree of success. The ability to convert diesel engines to successfully and efficiently operate on an alcohol fuel such as a methanol is affected by the fact that such alcohol fuels do not spontaneously ignite in the combustion chamber of a typical diesel engine. This problem may be overcome by modification of a diesel engine to provide for spark ignition of fuel in a supplementary small combustion chamber connected to a main combustion chamber of a diesel engine; but problems have arisen in the development of this system and the system does involve substantial modifications to the basic engine and associated component design, and the adoption of such a system as a whole is not considered at present to be a viable commercial proposition.

Detailed Description Text (8):
(c) The reactor converter 10 can be provided with a supplementary electrical heating element for initial warm-up and operation for conversion of the methanol to ether or DME, with the exhaust system 11 taking over the heating and conversion operation again on reaching the desired temperature. This system is however not favored (except perhaps in the case of a stationary engine and the ability to employ mains electric power), as in the case of a motor vehicle there would be an undesirable electric power draw-off from the battery prior to starting; and also a time delay in starting of the engine 1.

Detailed Description Text (12):
Normally, the employment of an alternative fuel supply system and apparatus for operation of diesel engines on a liquid alcohol fuel such as methanol will in many instances involve the requirement of making some modification to or adjustment of the fuel injector pump, or to provide an alternative specially designed injector pump, so as to be capable of accommodating the larger volume (when compared with the volume of diesel oil fuel providing the same power output - methanol having in the region of about half the calorific value of diesel oil fuel) of methanol or other liquid alcohol fuel to be employed as the principal fuel. The degree of charge will of course be dependent upon the nature and required operations of the engine concerned, and minimal change to the fuel injection pump may be in order where optimum performance of the engine is of no real concern. For example, in a stationary engine set-up with the engine arranged to normally operate at a substantially constant speed or within a substantially constant or limited speed range, a simple increase in the standard injector pump 2 maximum rack opening position is likely to be sufficient compensation for the reduced calorific value of methanol when compared with diesel oil; but for higher speeds a more complete

retuning of the injection system may be required.

Detailed Description Text (24):
Further modifications for most effective operation under a wide range of engine speeds and loads, as may be required in particular in vehicle operation, can include the installation of further cylinder head and oil temperature control devices, and a methanol or other alcohol fuel recirculation system to prevent vapor lock in the injection pump 2. In more sophisticated engine systems electronics can be employed for the close control of principal alcohol fuel and/or pilot fuel, whereby such supply is subject to control according to engine loading and/or speed; but generally speaking the provision of the basic equipment comprising the controlled pilot fuel pump 8 for determining substantially precise pilot fuel requirements fed to the reactor converter 10 and engine 1, the catalyst or ether generator 10 and the provision of a condensate separator 16 or condenser 18 and means for controlling the supply of drier or dry DME and fuel vapor to the engine 1 in prescribed quantities with the inlet air, will enable employment of the normally provided engine and associated components without major modifications and with sufficient efficiency to enable employment of up to 100% methanol as the main operation fuel and without the need to provide a separate main supply for diesel fuel. The provision for inlet air and/or exhaust gas throttling involves no major change to existing inlet and exhaust systems and is thus a desirably incorporated feature facilitating effective operation under light loads by maintaining gas exhaust temperatures above 250.degree. C.

Detailed Description Text (26):
It will thus be seen that the present invention can be readily applied to existing vehicles or machinery (stationary or moving) employing compression ignition engines normally designed to operate on diesel fuel, with standard "kit-set" componentry; and/or new vehicles and machinery employing compression engines for operation on methanol as described can be provided with relatively little additional costs, and with viable monetary savings and gains in operating costs with the generally lower costs of methanol and other alcohol fuels - without loss in efficiency in operation and with the further added advantages of methanol or other alcohol fuel employment involving clean burning with less air pollution, and also longer engine life under most operating additions, when compared with conventional diesel oil use.

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L14: Entry 2 of 8 File: USPT Jun 9, 1992

US-PAT-NO: 5121324
DOCUMENT-IDENTIFIER: US 5121324 A

TITLE: Motor vehicle magagement and control system including solenoid actuated fuel injection timing control

DATE-ISSUED: June 9, 1992

INVENTOR-INFORMATION:

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APPL-NO: 07/ 454269 [PALM]
DATE FILED: December 21, 1989

INT-CL: [05] G06G 15/50, F02D 31/00, F02M 59/20

US-CL-ISSUED: 364/431.05; 123/500, 123/349, 123/351, 364/426.04, 364/431.07
US-CL-CURRENT: 701/105; 123/349, 123/351, 123/500, 701/104, 701/110

FIELD-OF-SEARCH: 364/431.01, 364/431.03, 364/431.04, 364/431.05, 364/431.07, 364/424.1, 364/424.01, 364/426.04, 123/500-503, 123/357, 123/349, 123/350, 123/351

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
3603112	September 1971	Sola	464/2
3628889	December 1971	Kobayashi et al.	123/502
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☐				
☐	3934430	January 1976	Fuso	123/502 X
☐	4493303	January 1985	Thompson et al.	123/357
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☐	4809177	February 1989	Windle et al.	364/424.01
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ART-UNIT: 234

PRIMARY-EXAMINER: Lall; Parshotam S.

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ATTY-AGENT-FIRM: Rothwell, Figg Ernst & Kurz

ABSTRACT:

An electronic integrated engine and vehicle management and control system includes an electronic vehicle control module and a fuel injection control module, in communication with each other, which together control the total vehicle and engine operation functions of a heavy duty vehicle. A novel fuel injection timing device is utilized with the control module to allow precise and sophisticated control of engine timing based on a number of engine and vehicle operating parameters as determined by the control modules. Functions such as engine speed control, vehicle road speed control, engine protection shutdown, fuel economy, braking control and diagnostics are performed by the system.

8 Claims, 8 Drawing figures

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L14: Entry 2 of 8 File: USPT Jun 9, 1992

DOCUMENT-IDENTIFIER: US 5121324 A
TITLE: Motor vehicle magagement and control system including solenoid actuated fuel injection timing control

Abstract Text (1):
An electronic integrated engine and vehicle management and control system includes an electronic vehicle control module and a fuel injection control module, in communication with each other, which together control the total vehicle and engine operation functions of a heavy duty vehicle. A novel fuel injection timing device is utilized with the control module to allow precise and sophisticated control of engine timing based on a number of engine and vehicle operating parameters as determined by the control modules. Functions such as engine speed control, vehicle road speed control, engine protection shutdown, fuel economy, braking control and diagnostics are performed by the system.

Brief Summary Text (2):
This invention relates generally to control systems for motor vehicles, and more particularly to integrated electronic motor vehicle management and control systems specifically useful in heavy duty vehicles such as trucks, in which various engine and vehicle functions such as engine timing and speed control, road speed control, vehicle safety functions, fuel exhaust emissions monitoring, fuel economy and diagnostic and maintenance functions are performed and monitored by an integrated microprocessor based control module system.

Brief Summary Text (3):
In the past, most engine and vehicle control functions in heavy duty vehicles were performed mechanically in response to very simple parameters such as engine speed. The execution of such functions was thus limited and optimization in terms of fuel economy, engine performance and engine emissions quantities was not possible. In addition, certain diagnostic and maintenance functions were left to human performance and thus such functions were not necessarily performed optimally or performed in a manner interrelated with the performance and parameters of other vehicle functions.

Brief Summary Text (5):
The present invention provides a management and control system for a motor vehicle in which engine speed and timing control and various vehicle functions such as engine system monitoring, display, diagnostics and maintenance are controlled by a microprocessor based electronic control module. The control system is further provided with programming capability for optimizing control functions with respect to particular vehicle parameters based on the type of vehicle within which the control system is installed, including such parameters as engine size and type, tire size and properties, and carrier ratio.

Drawing Description Text (2):
FIG. 1 is a block diagram of an electronic vehicle and engine management and control system according to one embodiment of the present invention;

Drawing Description Text (3):
FIG. 2 is a detailed block diagram of the vehicle management and control module of

FIG. 1;

Detailed Description Text (2):
FIG. 1 is a block diagram of an electronic control system for a heavy duty vehicle according to one preferred embodiment of the present invention. The system is based on two control modules, a vehicle management and control module 100 and a fuel injection module 200, interconnected by a serial data communication line 10 which conforms to standards set by the Society of Automotive Engineers (S.A.E.). The control modules 100 and 200 are also connected by a general data bus 20 through which data relating to engine speed and fuel quantity are transmitted. The serial data communication line 10 is also connectable to an external computer such as a personal computer or equivalent data processing device, which allows external programming and modification of data used in the performance of the various algorithms by the control modules.

Detailed Description Text (3):
The vehicle management control module 100 has inputs connected to a plurality of sensors 101 which will be further described in conjunction with FIG. 2. In response to the sensor signal inputs, the vehicle management control module 100 produces a fuel injection timing signal 103, speedometer and tachometer data signals 105, a signal to alert an operator of the vehicle of a fault condition by activating an audible or visual driver alarm 107, signals driving various fault lamps 109 to indicate a problem with data received by the control module 100, and appropriate data through communication lines 10 and 20 to the fuel injection control module 200 to coordinate proper fuel injection.

Detailed Description Text (5):
The operation of the vehicle management and control module 100 will be more clearly understood with reference to FIG. 2. The vehicle management and control module 100 is composed of a microprocessor 1001, a random access memory 1005, and an EPROM 1003, and an EEPROM 1004. The inputs to the microprocessor 1001 comprise a number of pulse width modulated (PWM) inputs 1007, a plurality of digital data inputs 1009, and a plurality of analog inputs 1011. The pulse inputs include a pulse signal from an mph sensor which is mounted near the vehicle's transmission output shaft so as to provide an electrical pulse each time one of the teeth of a tone wheel mounted on the transmission output shaft passes the tip of the sensor. The frequency of the mph sensor output pulses is proportional to the rotational velocity of the transmission output shaft. The road speed of the vehicle can thus be calculated by factoring the number of teeth on the tone wheel, the gear ratio between the transmission output shaft and the vehicle axle shaft, and the rolling circumference of the drive axle tires. These data values can be programmed into the module memory for each specific type of vehicle in which the system is installed. The timing event sensor is mounted proximate the fuel injection pump camshaft of the vehicle engine and generates a pulse when the fuel injection pump camshaft attains an angular position corresponding to port closure or beginning of fuel injection for a predetermined plunger of the injection pump. The engine position sensor is mounted proximate the engine crankshaft and generates a pulse when the crankshaft attains an angular position related to top dead center (TDC) of the corresponding piston of the cylinder to which the plunger is coupled, on its power stroke. The data line 20 is a pulse width modulation signal line which communicates engine speed and fuel quantity data to the microprocessor 1001 from the fuel injection control module 200.

Detailed Description Text (7):
The analog inputs include an oil pressure signal from an oil pressure sensor mounted within the vehicle crankcase to measure the oil pressure of the system.

Detailed Description Text (9):
The microprocessor also includes a plurality of PWM outputs 1013 and dc current outputs 1015. The pulse outputs 1013 include a fuel request signal which is

transmitted to the fuel injection control module 200, and tachometer and speedometer signals which are transmitted to display devices on the vehicle dashboard. The tachometer signal is also inputted to the fuel injection control module 200 through the data line 20 to provide a redundant signal to the fuel injection control module which is used in the calculation of the amount of fuel to be injected by the fuel pump.

Detailed Description Text (11):
The fuel injection control module 200 is further described with reference to FIG. 3. The fuel injection control module 200 is a commercially available device obtainable from Robert Bosch, for example. The control module is a microprocessor based system and includes basic functional components including a microprocessor 2001, and random access and read only memories 2002 and 2003. The microprocessor is connected via interfaces to the SAE serial data communication link 10 and the data line 20 to enable communication with the vehicle management and control module 100 as well as to other various control devices in the vehicle. The control module 200 reads input signals from an accelerator pedal position sensor 2004, an engine speed sensor 2005, a coolant temperature sensor 2006, a fuel rack position sensor 2007, and a torque limiter switch 2008. The accelerator pedal position sensor includes a potentiometer connected to the accelerator pedal in the vehicle cab and provides a voltage signal proportional to the position of the acceleration pedal relative to the floor of the vehicle cab. The engine speed sensor is mounted proximate the engine crankshaft and generates a pulse signal whose frequency is proportional to the speed of rotation of the engine crankshaft. The coolant temperature sensor 2006 provides a digital signal representative of engine coolant temperature. The fuel rack position sensor 2007 provides a voltage signal proportional to the position of the fuel rack of the fuel injection pump, which relates to the amount of fuel injected during each cycle of engine rotation. The torque limiter switch 2008 is a transmission mounted toggle switch which is activated by the vehicle operator. In response to the five input parameters, and supplemental speed and fuel quantity data information from the control module 100, the injection control module 200 determines the amount of fuel to be supplied by the fuel injection pump to the engine and generates a fuel rack actuator drive signal 2009, which is a pulse width modulated signal that controls the position of the fuel rack by energizing a proportional solenoid. The module 200 produces a signal 2011 which prevents DYNATARD operation when fuel is being injected into the engine. The fuel shut-off signal 2010 provides a safety measure by energizing a solenoid valve to allow fuel to be supplied to the fuel pump. In the case where power is removed from the fuel injection control module, the fuel shut-off signal 2010 will go low to deenergize the solenoid and cut off the flow of fuel.

Detailed Description Text (12):
The various functions of the vehicle management and control module 100 will now be described. FIG. 4 illustrates a timing diagram for determining the engine timing. Control module 100 receives a timing event sensor pulse at time T.sub.1 which indicates the beginning of fuel injection to a specified cylinder of the engine. At time T.sub.2, the engine crankshaft reaches an angular position equal to top dead center (TDC) of the piston in the specified cylinder. The engine position sensor is configured to produce a pulse at a crankshaft position related to the top dead center, which is generally longer than the interval from port closure to top dead center to allow a more accurate timing measurement to be taken. The difference in time .increment.T between the reception of the timing event sensor pulse and the engine position sensor pulse represents a measure of angular rotation of the crankshaft in degrees. Since the time between T.sub.2 and T.sub.3 is known in advance, the calculation of timing in degrees before top dead center (BTDC) can be calculated.

Detailed Description Text (14):
Control module 100 constantly monitors engine oil pressure, engine coolant level and coolant temperature to determine whether the engine is operating within

prescribed parameter limits. Ranges of oil pressure, coolant level and coolant temperature have been determined empirically to indicate engine malfunction. These ranges are stored in the control module memory as either single values for all engine operating conditions, or as functions of engine speed, temperature, power output, or other operating parameters. Upon reaching a first limit beyond normal operating parameters, the control module will activate the driver alarm 107 to alert the operator that the engine should be stopped. If the operator has not shut off the engine in response to the alarm, and the signal values have reached a second level beyond normal operating parameters, the control module will transmit a fuel request signal 111 to the fuel injection control module on the data line 20 that will set the amount of fuel being injected to bring the engine to idle speed, and further transmits a command on the SAE serial data link 10 directing the fuel injection control module to stop the engine. A shutdown override switch can be provided on the vehicle instrument panel which, when activated, delays the automatic shutdown of the engine by some preset period of time, such as 30 seconds, to allow the vehicle operator to move the vehicle safely off the road before losing engine power.

Detailed Description Text (15):
The control module 100 monitors vehicle road speed and engine speed in conjunction with information from various switches indicating application of brakes, clutch, and switches mounted on the instrument panel, to maintain vehicle operation within specified limits. These limits, such as minimum and maximum engine speeds and maximum vehicle road speed can be programmed into the control module memory via the SAE serial data communication link from an external computer such as a PC, which can be interfaced with the control module through a serial port connector attached to the data communication link 10. If the control module determines that any modifications are needed to maintain vehicle and engine operation within the prescribed limits, the fuel quantity required to maintain the desired operating parameters is calculated and its value is transmitted as a fuel request signal 111 to the fuel injection control module, with a confirming signal being sent via the SAE data communication link 10.

Detailed Description Text (17):
The control module 100 also performs a cruise control function in which an operator can set a predetermined vehicle speed through actuation of a switch on the instrument panel which will then cause the control system to adjust fuel injection quantity in order to maintain the desired speed.

Detailed Description Text (18):
Since the cruise control function must be disengaged upon application of the service brakes to maintain safe operator control of the vehicle, correct operation of the service brake indication switch is continuously monitored. Referring to FIG. 7, when in the cruise control mode, the control system monitors the deceleration rate of the vehicle by calculating the derivative of the vehicle road speed. If the vehicle decelerates at a rate greater than or equal to an empirically derived rate above which it would be impossible to achieve without the application of service brakes, the cruise control function will automatically be disabled. However, since deceleration rates above the derived rate can occur without application of service brakes in certain conditions, such as application of the engine brake or climbing a grade, the control system of the present invention monitors the fuel quantity signal to determine whether fueling of the engine is occurring or not. If, in a cruise control mode, the engine is fueling to maintain a specific speed, it would be impossible to experience a deceleration rate greater than the empirically derived rate of 3 mph/sec, unless the service brakes are applied. In this condition, the cruise control function will be automatically disabled. However, if, in the cruise control mode, the engine is not being fueled, which would be indicative of climbing a grade, the control system will use a deceleration rate higher than the derived rate, such as 6 mph/sec without service brake application, to determine whether the service brake switch has failed.

Detailed Description Text (19):
In the case where the control module detects a vehicle road speed above the preset road speed limit, the module generates a fuel request signal which causes the fuel injection control module to stop fueling the engine to insure that the vehicle operator would not be able to exceed the stored limit. It is possible, however, for a loaded vehicle to exceed the stored road speed limit while going down hill. In such a case, the control module would transmit a fuel quantity request signal of zero to disable any additional increase in vehicle speed. If the vehicle transmission should jump out of gear and into neutral at such time, the operator will not be able to fuel the engine to increase engine speed sufficiently to place the transmission back into gear. To eliminate such an occurrence, the control module detects a ratio of engine speed to vehicle road speed and compares this calculated ratio with a prestored minimum engine speed to road speed ratio. FIG. 8 is a flow chart explaining this operation. The minimum stored ratio is determined based on the minimum possible engine rotational speed at the road speed limit. As long as the actual vehicle speed is above the stored road speed limit and the transmission is in gear, the engine speed-to-vehicle speed ratio will be above the stored minimum. However, if the engine speed-to-vehicle speed ratio is below such minimum, the transmission must be out of gear. Upon the occurrence of such a condition, the road speed limiting function will be disabled for a specified period of time to allow the operator to rev up the engine and place the transmission back into gear.

CLAIMS:

1. A management and control system for a motor vehicle, comprising:

electronic vehicle control means for controlling operations of the vehicle and an engine mounted within said vehicle, including

means for receiving a timing event signal representing the injection of fuel into a specific cylinder of said engine from a fuel injection pump,

means for receiving an engine position signal representing a predetermined position of a piston of said specific cylinder relative to Top Dead Center (TDC) occurring after the detection of said timing event signal,

means for calculating engine timing as a function of the time difference between said engine position signal and said timing event signal,

means for calculating engine angular velocity as a function of the frequency of said engine position signals,

means for receiving a fuel quantity signal representing the amount of fuel being injected into the cylinders of said engine,

means for determining a desired engine timing as a function of said engine angular velocity and said received fuel quantity signal,

means for calculating the difference between said desired engine timing and said calculated engine timing,

means for developing a timing advance/retard signal proportional to said calculated difference for advancing or retarding the engine timing to reduce the difference between said desired and calculated engine timings to zero,

means for receiving an oil pressure signal representing the amount of engine oil pressure in said engine,

means for receiving a coolant level signal representing the amount of engine coolant in said engine,

means for receiving a coolant temperature signal representing the temperature of said engine coolant,

means for comparing said oil pressure, coolant level and coolant temperature signals with stored signal values indicating engine malfunction, generating an alarm signal warning an operator of possible engine damage at a first level of malfunction, and generating an engine shutdown signal for stopping operation of said engine at a second level of malfunction,

means for receiving a signal proportional to vehicle road speed and calculating the road speed of said vehicle,

means for storing a maximum vehicle road speed,

means for storing minimum and maximum engine speeds,

means for comparing said calculated road speed and engine angular velocity with said stored road and engine speeds,

means for developing a fuel quantity request signal for controlling the amount of fuel supplied to said engine to keep said road and engine speeds within said stored ranges,

means for calculating the deceleration rate of said vehicle,

means for receiving a service brake signal representing application of vehicle service brakes,

means for comparing said deceleration rate with said fuel quantity signal in the absence of said service brake signal and disengaging a cruise control function when the rate of deceleration exceeds a first value when fueling, and when the rate of deceleration exceeds a second value higher than said first value when not fueling,

means for calculating a ratio of engine speed-to-road speed,

means for storing a minimum engine speed-to road speed ratio, and

means for comparing said calculated ratio with said stored ratio, determining that the transmission of said vehicle has jumped out of gear when said calculated ratio is less than said stored ratio, and overriding said fuel quantity request signal, when said road speed is higher than said stored maximum road speed;

electronic fuel injection control means for controlling the injection of fuel into the cylinders of said engine, including

means for receiving an accelerator pedal position signal representing the position of an accelerator pedal of said vehicle indicating the road speed desired by an operator,

means for receiving an engine speed signal representing the angular velocity of said engine,

means for receiving a fuel rack position signal representing the position of a fuel rack on a fuel injection pump of said engine,

means for receiving said fuel quantity request signal from said electronic vehicle control means, and

means for developing a fuel rack actuation signal for controlling the position of said fuel rack to adjust the amount of fuel being injected into said cylinders, in response to the values of said accelerator pedal position signal, engine speed signal, fuel rack position signal, and fuel quantity request signal;

fuel injection timing means responsive to said timing advance/retard signal for modifying the timing of fuel injection into said cylinders relative to piston position from TDC; and

a serial data communication line interconnecting said electronic vehicle control means and said electronic fuel injection control means for transmitting digital data therebetween.

2. A management and control system for a motor vehicle according to claim 1, wherein said serial data communication line conforms to SAE (Society of Automotive Engineers) standards for such communication lines, said system further comprising:

a detection circuit for detecting the transmission of data on said serial data communication line, including

means for generating a clock pulse signal,

counter means for counting said clock pulse signals up to a predetermined count,

logic means connected to outputs of said counter means for providing a transmission enable signal and disabling clock pulse signal input when said counter means has reached said predetermined count, and

means for resetting said counter means when said serial data communication line is transmitting data.

3. A management and control system for a motor vehicle according to claim 1, further comprising:

a serial data connector coupled to said serial data communication line for interconnecting said serial data communication line with an external data processor to enable imputing of said maximum road speed, said minimum and maximum engine speeds, and values of other parameters used in calculations performed by said electronic vehicle control means.

4. A management and control system for a motor vehicle according to claim 1, wherein said fuel injection timing means comprises:

a cylindrical housing;

an annular outer shaft within said housing being driven by said engine;

a cylindrical inner shaft within said outer shaft being coupled to a camshaft of said fuel injection pump;

a splined sleeve coupling said outer shaft to said inner shaft and movable in an axial direction to change the phase angle of rotation between said outer and inner shafts; and

sleeve driving means responsive to said timing advance/retard signal for driving said splined sleeve in said axial direction for modifying the timing of fuel injection to correspond to said desired engine timing.

5. A management and control system for a motor vehicle according to claim 4,

wherein said sleeve driving means comprises a solenoid valve assembly including a solenoid for receiving said timing advance/retard signal, a spool valve selectively movable by said solenoid when energized by said timing advance/retard signal, said spool valve controlling the amount of oil pressure applied to said splined sleeve which in turn controls the axial position of said splined sleeve relative to said outer and inner shafts.

6. A management and control system for a motor vehicle, comprising:

electronic vehicle control means for controlling operations of the vehicle and an engine mounted within said vehicle, including

means for receiving a signal proportional to vehicle road speed and calculating the road speed of said vehicle,

means for calculating the deceleration rate of said vehicle,

means for receiving a service brake signal representing application of vehicle service brakes, with a fuel quantity signal in the absence of said service brake signal and disengaging a cruise control function when the rate of deceleration exceeds a first value when fueling, and when the rate of deceleration exceeds a second value higher than said first value when not fueling,

means for calculating a ratio of engine speed-to-road speed,

means for storing a minimum engine speed-to road speed ratio, and

means for comparing said calculated ratio with said stored ratio, determining that the transmission of said vehicle has jumped out of gear when said calculated ratio is less than said stored ratio, and overriding a fuel quantity request signal, when said road speed is higher than said stored maximum road speed.

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L23: Entry 1 of 6 File: PGPB Sep 19, 2002

DOCUMENT-IDENTIFIER: US 20020133279 A1
TITLE: METHOD AND APPARATUS FOR CONTROLLING STRAIGHT LINE TRAVEL OF A TRACKED MACHINE

Current US Classification, US Primary Class/Subclass:
701/50

Brief Description of Drawings Paragraph:
[0008] FIG. 2 is a block diagram illustrating an exemplary drive transmission for a tracked machine;

Detail Description Paragraph:
[0013] For example, as exemplified in FIG. 1, the tracked machine 102 is depicted as a track-type tractor, suitable for use in a number of earthworking operations, such as mining, construction, and the like. However, other types of tracked machines could also be used with the present invention, such as, but not limited to, skid-steer loaders, tracked loaders, excavators, and agricultural tracked machines.

Detail Description Paragraph:
[0015] An example of a drive transmission for a tracked machine 102 is shown in FIG. 2. In this example, an engine 202 provides power to the tracks 104. The distribution of power is controlled by pumps 204 and motors 206.

Detail Description Paragraph:
[0021] The technique of FIG. 3 typically uses speed sensors (not shown) to sense the speed of either the left and right tracks 104-L, 104-R, or the motors 206 which drive the tracks 104. These sensors add to the overall costs of the tracked machine 102, and usually are prone to damage by the harsh environments typically experienced by the tracked machine 102.

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Y

L4: Entry 2 of 10 File: PGPB Sep 16, 2004

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PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040181332 A1

TITLE: Method for converting a fuel quantity into a torque

PUBLICATION-DATE: September 16, 2004

INVENTOR-INFORMATION:

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APPL-NO: 10/ 808900 [PALM]
DATE FILED: March 25, 2004

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US-CL-PUBLISHED: 701/104
US-CL-CURRENT: 701/104

REPRESENTATIVE-FIGURES: 1

ABSTRACT:

With a method for converting a fuel quantity (MF) into a torque (TQ) in an internal combustion engine, the efficiency (H) of the internal combustion engine is determined at the current operating point prior to the conversion as the ratio of actual torque (TQ) and actual fuel quantity (MF), and the required torque (MF) is determined from the efficiency (H) and the fuel quantity (MF).

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application is a continuation of copending International Application No. PCT/DE03/02279 filed Jul. 8, 2003 which designates the United States, and

claims priority to German application no. 102 34 706.9 filed Jul. 30, 2002.

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L4: Entry 2 of 10 File: PGPB Sep 16, 2004

DOCUMENT-IDENTIFIER: US 20040181332 A1
TITLE: Method for converting a fuel quantity into a torque

Summary of Invention Paragraph:
[0007] This increasing complexity of the conversion of a required total torque into a fuel quantity results in the problem that correspondingly it is also becoming increasingly difficult to convert a fuel mass into a torque. Conversions of this kind, as required in the method of the type mentioned, occur for example when fuel quantity limit values, for example a maximum fuel quantity which can be released by an injection system, have to be converted into a nominal torque so that they can be taken into account in a typical torque-based control structure. A further example of a fuel quantity limit value which often has to be converted into a torque during operation can be found in smoke limiting functions of the type that are standard for modern diesel internal combustion engines. Under the control of operating parameters, functions of this kind output a maximum fuel mass which must not be exceeded if undesirable smoke formation is to be avoided. In order to integrate functions of this kind into a torque-based control structure, a nominal fuel mass has to be converted into a nominal torque.

Summary of Invention Paragraph:
[0018] In the modification a wide variety of manipulations can be performed on the efficiency curve, for example multiplication with a fuel mass-dependent factor or similar. It is particularly simple and yet surprisingly accurate to form the difference between calculated and indicated efficiency during the comparison and to shift the efficiency curve by precisely this difference during the modification. The underlying assumption here, that operating parameters deviating from the standard operating conditions essentially lead to a shift in the efficiency curve, has revealed itself as suitable for most applications.

Summary of Invention Paragraph:
[0020] A common application in which a nominal fuel quantity has to be converted into a nominal torque arises, as has been mentioned already, with a smoke limiting function of a diesel internal combustion engine. In that case the method can be used to particular advantage. It is therefore to be preferred that the nominal fuel quantity is an operating point-dependent maximum fuel quantity determined by a predefined smoke behavior of the internal combustion engine, whereby, if said maximum fuel quantity is exceeded, an impermissible smoke generation would result at the operating point due to the internal combustion engine.

Detail Description Paragraph:
[0030] On the input side the torque calculation unit 2 processes various torque requirements. The most important of these is a torque requirement TQ-DRV originating from an accelerator pedal transmitter 4, said torque requirement representing the torque required by the driver of a motor vehicle equipped with the internal combustion engine. The torque calculation unit 2 also takes into account external torque requirements 5 which, in the block diagram shown in FIG. 1, are supplied to the torque calculation unit 2 in the form of a torque requirement TQ-EXT. External torque requirements 5 of this kind can be, for example, requirements from external power loads such as air conditioning systems or similar. A speed control system is also an example of an external torque requirement 5.

Detail Description Paragraph:
[0031] It is provided in the concept of the torque-based structure 1 that only torque requirements are supplied to the torque calculation unit 2. That said, however, there are individual functions which output, not a torque requirement, but a fuel mass limit value. Examples of these are a smoke limiting unit 6 or a torque limiting unit 7, both of which output values for fuel masses which (at the current operating point) must not be exceeded on account of exhaust gas- or engine-related factors. The fuel mass limit values MF-SM and MF-TQ output by these units cannot now be simply supplied to the torque calculation unit 2, as the latter cannot process values for fuel masses. It is therefore essential to convert these fuel mass limit values into torque limit values. In the torque-based structure shown in FIG. 1, there is provided for this conversion an efficiency calculation module 8 which accepts the value for the fuel mass MF, as output by the main engine characteristic map 3, and the value for the torque TQ output by the torque calculation unit 2. In a manner still to be described, the efficiency calculation module 8 converts these two values, torque TQ and fuel mass MF, into an efficiency H which, by means of a simple multiplication in a multiplier 9, permits the fuel mass limit values MF-SM and MF-TQ to be converted into corresponding torque limit values TQ-SM and TQ-MAX respectively. These can then be fed in to the torque calculation unit so that the function of the smoke limiting unit 6 and the torque limiting unit 7, which, in the block diagram shown in FIG. 1, stand as examples of functions which output a fuel mass value, can be taken into account in a simple manner in the torque-based structure 1.

Detail Description Paragraph:
[0033] With this efficiency H, the nominal fuel quantities in the form of the fuel mass limit values MF-SM and MF-TQ are then converted in the multiplier 9 into nominal torque values in the form of the torque limit values TQ-SM and TQ-MAX. The implementation concept of the efficiency calculation module 8 as set forth in the block diagram shown in FIG. 2 therefore makes provision for the efficiency from the preceding calculation cycle to be used for the current conversion of nominal fuel mass into nominal torque.

Detail Description Paragraph:
[0036] By means of the efficiency curve 14 shifted by the shift 13 obtained in this way, the efficiency for the fuel mass limit value MF-SM(1), as output by the smoke limiting unit 6 at the current operating point, can then be easily determined. FIG. 3 clearly shows that on account of the shift 13 the efficiency H(MF-SM(1)) thus obtained deviates markedly from that that would be obtained with the original efficiency curve 12. As an alternative to the modification of the efficiency curve 12, the shift 13 can also be applied directly to the efficiency H which the unmodified efficiency curve 12 indicates for the fuel mass limit value MF-SM(1).

Detail Description Paragraph:
[0037] The efficiency 8 determined in this way is then used in the multiplier 9 for determining the desired torque limit value TQ-SM. A similar method is also used for the fuel mass limit value MF-TQ which is output by the torque limiting unit 7.

Detail Description Paragraph:
[0038] The approach depicted in FIG. 3 of using the efficiency curve 12 in the efficiency calculation module 8 is advantageous in particular when the fuel mass which the torque-based structure 1 provides for the internal combustion engine at the current time MF(1) differs widely from the fuel mass limit value MF-SM or MF-TQ, with the result that the assumption that the same efficiency applies for the fuel mass limit value as for the current operating point would lead to impermissible errors in the determination of the torque limit values.

Detail Description Paragraph:
[0039] If the difference between the current value for the fuel mass MF(1) and the

fuel mass limit value is only slight, in particular if it is below a specific threshold value, the efficiency calculation module 8 omits to refer to an efficiency curve 12 and instead uses an extrapolation. In this case an efficiency H (MF(1)) is determined from the fuel mass MF(1) and the current torque TQ(1) at the current time. At the next calculation clock pulse (2) the same happens for the now present fuel mass MF(2) and the now present torque TQ(2). The resulting change in efficiency (the efficiency H(MF(2)) is now given) and fuel mass is used for an extrapolation which is illustrated in FIG. 4 by an extrapolation straight line 15. It is therefore assumed that owing to the deviation of the value for the current fuel mass MF from the current fuel mass limit value (e.g. MF-SM), said deviation lying below a predetermined threshold value, a linear approximation of the efficiency curve 12 (drawn in as a dashed line in FIG. 4 for clarity) is possible. As a result of the extrapolation, the efficiency H lying on the extrapolation straight line 15 for the fuel mass limit value (e.g. MF-SM(2)) is then obtained. This is then output by the efficiency calculation module 8 and used in the multiplier 9.

CLAIMS:

7. The method according to claim 1, wherein an extrapolation of the efficiency is used to determine the nominal torque, in order to determine the efficiency use is made of an efficiency curve which indicates the maximum ratio of torque and fuel quantity as a function of the fuel quantity, at the current operating point the ratio of actual torque and actual fuel quantity is calculated and compared with the efficiency indicated by the efficiency curve and, depending on the result of this comparison, the efficiency curve is modified, in the comparison the difference between calculated and indicated efficiency is formed and during the modification the efficiency curve is shifted by this difference, the nominal torque is determined by means of the modified efficiency curve, in order to determine the nominal torque the extrapolation is performed if a difference between actual fuel quantity and nominal fuel quantity lies below a specific threshold value, and otherwise the modified efficiency curve is generated and used in order to determine the nominal torque..

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☐ 1. Document ID: US 20050188948 A1

Using default format because multiple data bases are involved.

L4: Entry 1 of 10 File: PGPB Sep 1, 2005

PGPUB-DOCUMENT-NUMBER: 20050188948
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20050188948 A1

TITLE: Internal combustion engine control device

PUBLICATION-DATE: September 1, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Miura, Manabu	Zushi-shi		JP	

US-CL-CURRENT: 123/299

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

☐ 2. Document ID: US 20040181332 A1

L4: Entry 2 of 10 File: PGPB Sep 16, 2004

PGPUB-DOCUMENT-NUMBER: 20040181332
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040181332 A1

TITLE: Method for converting a fuel quantity into a torque

PUBLICATION-DATE: September 16, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Birkner, Christian	IrIbach		DE	
Feder, Johannes	Regensburg		DE	
Hirn, Rainer	Neutraubling		DE	

Przymusinski, Achim Lappersdorf DE

US-CL-CURRENT: 701/104

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 3. Document ID: US 5526797 A

L4: Entry 3 of 10 File: USPT Jun 18, 1996

US-PAT-NO: 5526797
DOCUMENT-IDENTIFIER: US 5526797 A

TITLE: Methods and apparatus for vaporizing and utilizing fuels of various octane ratings

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 4. Document ID: US RE31906 E

L4: Entry 4 of 10 File: USPT Jun 4, 1985

US-PAT-NO: RE31906
DOCUMENT-IDENTIFIER: US RE31906 E

TITLE: Control system for internal combustion engine

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 5. Document ID: US 4205377 A

L4: Entry 5 of 10 File: USPT May 27, 1980

US-PAT-NO: 4205377
DOCUMENT-IDENTIFIER: US 4205377 A

TITLE: Control system for internal combustion engine

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 6. Document ID: US 3473520 A

L4: Entry 6 of 10 File: USOC Oct 21, 1969

US-PAT-NO: 3473520
DOCUMENT-IDENTIFIER: US 3473520 A

TITLE: METHOD OF BURNING FUEL IN A DIESEL ENGINE

DATE-ISSUED: October 21, 1969

INVENTOR-NAME: MUHLBERG ERHARD

US-CL-CURRENT: 123/301; 123/306

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 7. Document ID: US 3074472 A

L4: Entry 7 of 10 File: USOC Jan 22, 1963

US-PAT-NO: 3074472
DOCUMENT-IDENTIFIER: US 3074472 A

TITLE: Fuel feeding system for gas turbine engines

DATE-ISSUED: January 22, 1963

INVENTOR-NAME: WILLIAMS HOWARD J

US-CL-CURRENT: 60/39.281

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 8. Document ID: US 2687710 A

L4: Entry 8 of 10 File: USOC Aug 31, 1954

US-PAT-NO: 2687710
DOCUMENT-IDENTIFIER: US 2687710 A

TITLE: Carburetor

DATE-ISSUED: August 31, 1954

INVENTOR-NAME: RAUEN JOHN T

US-CL-CURRENT: 261/39.3; 261/41.5, 261/63, 261/65, 261/75

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 9. Document ID: US 2453728 A

L4: Entry 9 of 10 File: USOC Nov 16, 1948

US-PAT-NO: 2453728
DOCUMENT-IDENTIFIER: US 2453728 A

TITLE: Carburetor

DATE-ISSUED: November 16, 1948

INVENTOR-NAME: RAUEN JOHN T

US-CL-CURRENT: 261/39.1; 261/121.4, 261/34.2, 261/34.3, 261/52

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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10. Document ID: US 2330159 A

L4: Entry 10 of 10 File: USOC Sep 21, 1943

US-PAT-NO: 2330159
DOCUMENT-IDENTIFIER: US 2330159 A

TITLE: Miles per gallon gauge

DATE-ISSUED: September 21, 1943

INVENTOR-NAME: THOMPSON LOUIS T E

US-CL-CURRENT: 73/114; 235/61J

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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Terms	Documents
L3 and (fuel$ with limit$)	10

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Electronic fuel control system

Document Number: United States Patent 4296601

Abstract: Fuel flow to a gas turbine engine is controlled in response to power lever position and CDP by a hydromechanical section. The hydromechanical section includes a torque motor which may be activated to modify the fuel flow to the engine in response to a control signal produced by an electronic control section. The electronic control section senses a number of engine and ambient parameters and generates engine operating limits from these parameters. The limit corresponding to the lowest maximum engine speed is selected and referenced to actual engine speed for generating the control signal, thereby providing a closed loop engine speed control. At least one of the computed limits is an actual maximum engine speed for steady state engine operation and is used to recompute the engine scheduled speed so that the actual maximum engine speed is obtained at the maximum power lever advance position; in this way power lever dead band is eliminated. The electronic control also modifies fuel flow to the engine for speed synchronization with another identically controlled engine.

Inventors: Martin, Anthony N.

Assignee: Otis Elevator Company (Hartford, CT)

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L56: Entry 1 of 1 File: USPT May 11, 1999

DOCUMENT-IDENTIFIER: US 5901684 A
TITLE: Method for processing crankshaft speed fluctuations for control applications

Detailed Description Text (9):
Referring to FIG. 4, a methodology 100 is illustrated for modifying the fuel injection pulsewidth signal to fuel injectors of the engine as a function of the combustion metric value according to the present invention. Fuel injection modification methodology 100 computes an average combustion metric value from the combustion metric value as provided in block 102 and compares the average combustion metric value with a desired combustion metric value 104 as provided by comparator 106. The desired combustion metric value is preferably programmed as a function of engine speed, manifold absolute pressure and coolant temperature and offers a control signal for controlling the fuel injection to the engine. Comparator 106 outputs a difference value between the average combustion metric value and the desired combustion metric and provides proportional-integral-derivative (PID) control. The PID control includes a proportional (P) gain block 108, an integral (.intg.) block 110, and a differential (.DELTA.) block 112. Each of the proportional, integral and differential blocks 108, 110 and 112, respectively, receives the output from comparator 106. The output from the proportional gain block 108 is applied to a summation block 114. The output of the integral block 110 is applied to a gain (I) block 111 and then output to the summation block 114. The output of the differential block 112 is applied to a gain (D) block 113 and then output to the summation block 114. The summation block 114 sums the inputs so as to provide a percentage correction value 116 that in turn is used to modify the fuel injection to the engine. The percentage correction value 116 is scaled in block 118 for implementation as a multiplier value. Scaling of the percentage correction value may be accomplished by adding 1.0 to the fractional percentage correction value, according to one embodiment. Methodology 100 provides a multiplier for the fuel injection pulsewidth such that the amount of fuel injected to the engine may be reduced from the scheduled amount provided in the programmed target fuel injection value 122. Accordingly, the programmed target fuel injection 122 is scaled by way of the multiplier 120 to realize a reduction of fuel supplied by the fuel injectors as provided in block 124.

L52: Entry 1 of 2 File: USPT May 11, 1999

DOCUMENT-IDENTIFIER: US 5901684 A
TITLE: Method for processing crankshaft speed fluctuations for control applications

Brief Summary Text (3):
The present invention relates generally to internal combustion engines in automotive vehicles and, more particularly, to a method of determining combustion stability of the engine and controlling the fuel injection pulsewidth to fuel injectors for the engine, especially following a cold start.

Brief Summary Text (5):
Automotive vehicles commonly employ a port-injected internal combustion engine in which a fuel injector sprays fuel into air in an intake manifold of the engine near an intake valve of a cylinder as air gets pulled into the cylinder during the cylinder's intake stroke. The conventional fuel injector is typically controlled in response to a fuel injection pulsewidth signal in which the pulsewidth determines the amount of fuel injected into the corresponding cylinder of the engine. The fuel injection pulsewidth signal can be implemented to follow a programmed target fuel injection curve. The programmed target fuel injection curve determines the fuel injection pulsewidth and is generally utilized to provide adequate engine performance when feedback engine control is not available.

Brief Summary Text (6):
Many automotive vehicles commonly employ an oxygen (O.sub.2) sensor generally disposed upstream of the exhaust system for sensing the oxygen level in the exhaust gas emitted from the engine. The oxygen sensor can serve to provide a feedback signal to control engine operation and adjust fuel injection to the engine to achieve good engine performance. However, some conventional oxygen sensors are required to warm up to a sufficiently high temperature before an accurate oxygen sensor reading may be obtained. Also, following an engine start, the oxygen sensor and processing devices initially may not have acquired enough information to provide adequate feedback control. Therefore, for a period of time immediately following cold start up of the vehicle engine, the oxygen sensor may not be capable of providing accurate information with which the engine may be controlled to operate to achieve low hydrocarbon emissions. As a consequence, excessive hydrocarbon emissions may be emitted from the vehicle within the immediate period following start up of the engine.

Brief Summary Text (10):
It is therefore one object of the present invention to provide for control of a vehicle engine based on a learned measurement of combustion stability of the engine.

Brief Summary Text (11):
It is another object of the present invention to provide for a learned combustion stability value which may be employed to control engine operation while maintaining adequate driveability and performance of the vehicle.

Brief Summary Text (15):
According to one embodiment, the learned combustion stability value is

advantageously employed so as to modify the fuel injection to an internal combustion engine, especially following a cold engine start so as to reduce hydrocarbon emissions. This is accomplished by modifying a programmed target fuel injection signal pulsewidth as a function of the learned combustion related value so as to reduce the fuel injected into the engine by fuel injectors. By reducing fuel injection as a function of the learned combustion stability value, reduced hydrocarbon emissions can be realized while maintaining good driveability and performance of the vehicle.

Drawing Description Text (3):
FIG. 1 is a schematic diagram of an electronic fuel injection system illustrated in operational relationship with an internal combustion engine and exhaust system of an automotive vehicle;

Drawing Description Text (4):
FIG. 2 is a block diagram further illustrating components of a vehicle used for sensing engine speed from a crankshaft and modifying fuel injection to the engine;

Drawing Description Text (7):
FIG. 5 is a graph illustrating engine fuel injection modification and shows a programmed fuel control curve contrasted with a modified fuel control curve; and

Detailed Description Text (2):
Turning now to FIG. 1, an electronic fuel injection system 10 is illustrated in operational relationship with an internal combustion engine 12 and an exhaust system 14 of an automotive vehicle (not shown). The exhaust system 14 includes an exhaust manifold 16 connected to the engine 12 and a catalyst 18 such as a catalytic converter connected by an upstream conduit 20 to the exhaust manifold 16. The exhaust system 14 also includes a downstream conduit 22 connected to the catalyst 18 and extending downstream to a muffler (not shown). The internal combustion engine 12 is a fuel injected engine and includes an intake manifold 24 connected to the engine 12 and a throttle body 26 connected to the intake manifold 24. The engine 12 also includes an air filter 28 connected by a conduit 29 to the throttle body 26. It should be appreciated that the engine 12 and exhaust system 14 are conventional and known in the art.

Detailed Description Text (4):
Referring to FIG. 2, a block diagram is provided which illustrates the components of the automotive vehicle 25 for measuring engine speed, determining a combustion related value and modifying fuel injection to the engine. A partial cut-away view of engine 12 is shown illustrating one of a multiple of cylinders 42 in the engine 12. As illustrated, a piston 44 is disposed in the cylinder 42 and is operatively connected by a connecting rod 46 to a crankshaft 48. A camshaft 50 is used to open and close at least one valve (not shown) of the cylinder 42 for various strokes of the piston 44. The piston 44 is illustrated in the expansion (power) stroke of a four stroke engine. In such a four stroke engine, the strokes include intake, compression, expansion (power), and exhaust. During the exhaust stroke, exhaust gases flow from the cylinder 42 via at least one valve and through the exhaust system 14. Although the embodiment shown is a four stroke engine, the principles of the present invention can also be applied to other internal combustion engines, such as a two stroke engine. It should be appreciated that a spark plug is present in the preferred embodiment, although it is not illustrated herein.

Detailed Description Text (5):
The automatic vehicle 25 further includes a sensor target 52 operatively connected to the crankshaft 48. The sensor target 52 has at least one, and preferably a plurality of trip points, which in the preferred embodiment are provided as slots 54, formed by teeth 56. The vehicle 25 also includes a crankshaft sensor 58 for communicating with the sensor target 52 and a camshaft sensor 60 in communication with the camshaft 50. The vehicle 25 further includes the manifold absolute

pressure (MAP) sensor 36, throttle position sensor 34, a vehicle speed sensor 62 and an engine temperature sensor 38. The outputs of the sensors 58, 60, 36, 34, 62 and 38 communicate with the engine controller 30.

Detailed Description Text (6):
The engine controller 30 includes a micro-controller 64 with a digital filter 66, memory 68, signal conditioning circuitry 70 and analog-to-digital (A/D) converters 72 to process outputs from the various sensors according to the methodology to be described hereinafter. In the preferred embodiment, the outputs of crankshaft sensor 58, camshaft sensor 60, and vehicle speed sensor 62 communicate with the micro-controller 64 via appropriate signal conditioning circuitry 70 which is particularized to the type of sensor employed. The output of the manifold absolute pressure sensor 36, throttle position sensor 34 and engine coolant temperature sensor 38 communicate with the micro-controller 64 via the A/D converters 72. The engine controller 30 including microcontroller 64 with digital filter 66 is used to determine a learned combustion stability value and modify a fuel injection control signal as will be described in more detail hereinafter. Memory 68 is a generic memory which may include Random Access Memory (RAM), Read Only Memory (ROM) or other appropriate memory. It should also be appreciated that the engine controller 30 also includes various timers, counters and like components.

Detailed Description Text (10):
In order to illustrate operation of the fuel injection modification methodology 100, FIG. 5 illustrates a programmed target fuel injection curve 126 contrasted with a reduced fuel injection curve 128 as provided by the fuel modification multiplier determined as described in connection with FIG. 4. For a period of time following vehicle startup, the fuel modification methodology 100 utilizes the combustion metric value so as to reduce the amount of fuel injected into the individual cylinders of the engine as may be appropriate to reduce hydrocarbon emissions emitted from the vehicle. The time period for modifying the fuel injection preferably lasts long enough until effective feedback control with the oxygen sensor may be realized. The time period may be set for forty seconds, according to one example, however, varying time periods may be necessary depending upon the engine, temperature, fuel combustibility as well as other factors. According to the example shown, it is preferred that the fuel modification methodology 100 be utilized to reduce the amount of fuel injected into the engine. It is also preferred that the modified fuel injection curve 128 does not exceed the programmed target fuel injection curve 126.

Detailed Description Text (11):
Referring to FIG. 6, a methodology 130 is illustrated for both computing a learned combustion-related value and utilizing the combustion-related value to provide fuel modification to fuel injectors of the engine. Methodology 130 begins with block 132 to obtain engine data such as engine speed, manifold absolute pressure and coolant temperature. Methodology 130 proceeds to block 134 to calculate the combustion metric value as was described above in connection with FIG. 3. An average combustion metric value is computed pursuant to block 136. Also, a determined expected combustion metric value is determined from the engine data and calibrations as provided in block 138. The computed average combustion metric value and the determined expected combustion metric value are compared via block 140 to provide a difference output between the two input signals. According to block 142, methodology 100 uses proportional-integral-differential (PID) control to control the combustion quality of the engine by calculating and applying a fuel injector pulsewidth multiplier to the programmed fuel injection signal to reduce the amount of fuel applied to the engine. Fuel reduction is provided, yet maintaining adequate driveability and performance of the vehicle, with reduced emissions when possible, especially following a cold engine start of the vehicle. Accordingly, the modified fuel injection reduces hydrocarbon emissions while maintaining good driveability of the vehicle when the oxygen sensor and/or feedback control may not be available.

2

L13: Entry 1 of 1 File: USPT Mar 24, 1992

US-PAT-NO: 5097803
DOCUMENT-IDENTIFIER: US 5097803 A

TITLE: Fuel supply and control system for compression ignition engines

DATE-ISSUED: March 24, 1992

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Galvin; Mark P.	Wadestown			NZ

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Her Majesty the Queen in right of New Zealand	Lower Hutt			NZ	07

APPL-NO: 07/ 568725 [PALM]
DATE FILED: August 17, 1990

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	1-215866	August 22, 1989

INT-CL: [05] F02B 43/10, F02M 27/02

US-CL-ISSUED: 123/3; 123/179.21, 123/1A
US-CL-CURRENT: 123/3; 123/1A, 123/179.21

FIELD-OF-SEARCH: 123/1A, 123/3, 123/304, 123/179H, 123/431

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

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	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	4133847	January 1979	Feuerman	123/3 X
☐	4413594	November 1983	Hirota	123/3
☐	4567857	February 1986	Houseman et al.	123/3
☐	4876989	October 1989	Karpuk et al.	123/3

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
0022876	December 1979	EP	
2306343	March 1976	FR	

ART-UNIT: 342

PRIMARY-EXAMINER: Argenbright; Tony M.

ATTY-AGENT-FIRM: Oblon, Spivak, McClelland, Maier & Neustadt

ABSTRACT:

A fuel supply system for a single or multi-cylinder internal combustion engine (1) of the compression ignition kind (e.g. a diesel engine) and including a liquid fuel injection pump (2) for injecting liquid fuel into the combustion chamber(s) of the engine (1); the system employing a main supply source of liquid alcohol fuel (4) such as methanol as the principal fuel for the engine and an ether pilot fuel having a wider flammability range and lower ignition temperature than the principal alcohol fuel. Prescribed quantities of the ether pilot fuel are arranged to be delivered to the engine (1) during operation for mixing with the principal fuel (4) and ignition of the delivered pilot fuel to raise the temperature of the fuel mixture in the combustion chamber(s) sufficiently to enable full ignition under compression of the principal fuel. The system preferably including an apparatus for producing the ether pilot fuel from a bypass supply (7,8,9) of the principal liquid alcohol fuel (4) by way of a heat exchanger/catalytic convertor device 10; and including a condensation separator (16,18) for removal of at least a part of any readily condensible content of the pilot fuel before delivery to the engine (1) to permit ignition under compression of the delivered pilot fuel.

29 Claims, 4 Drawing figures

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2

L13: Entry 1 of 1 File: USPT Mar 24, 1992

DOCUMENT-IDENTIFIER: US 5097803 A
TITLE: Fuel supply and control system for compression ignition engines

Brief Summary Text (4):
These proposals have been made for the employment of gases and liquid alcohol fuels as alternatives for spark ignition internal combustion engines and compression ignition or `diesel` engines; and while considerable success has been achieved with the employment of gaseous and liquid alcohol fuels as alternative fuels for spark ignition engines, and success to a lesser degree has been achieved with the gas conversion of diesel engines, proposals for operating diesel engines on a liquid alcohol fuel have not achieved the same degree of success. The ability to convert diesel engines to successfully and efficiently operate on an alcohol fuel such as a methanol is affected by the fact that such alcohol fuels do not spontaneously ignite in the combustion chamber of a typical diesel engine. This problem may be overcome by modification of a diesel engine to provide for spark ignition of fuel in a supplementary small combustion chamber connected to a main combustion chamber of a diesel engine; but problems have arisen in the development of this system and the system does involve substantial modifications to the basic engine and associated component design, and the adoption of such a system as a whole is not considered at present to be a viable commercial proposition.

Detailed Description Text (8):
(c) The reactor converter 10 can be provided with a supplementary electrical heating element for initial warm-up and operation for conversion of the methanol to ether or DME, with the exhaust system 11 taking over the heating and conversion operation again on reaching the desired temperature. This system is however not favored (except perhaps in the case of a stationary engine and the ability to employ mains electric power), as in the case of a motor vehicle there would be an undesirable electric power draw-off from the battery prior to starting; and also a time delay in starting of the engine 1.

Detailed Description Text (12):
Normally, the employment of an alternative fuel supply system and apparatus for operation of diesel engines on a liquid alcohol fuel such as methanol will in many instances involve the requirement of making some modification to or adjustment of the fuel injector pump, or to provide an alternative specially designed injector pump, so as to be capable of accommodating the larger volume (when compared with the volume of diesel oil fuel providing the same power output - methanol having in the region of about half the calorific value of diesel oil fuel) of methanol or other liquid alcohol fuel to be employed as the principal fuel. The degree of charge will of course be dependent upon the nature and required operations of the engine concerned, and minimal change to the fuel injection pump may be in order where optimum performance of the engine is of no real concern. For example, in a stationary engine set-up with the engine arranged to normally operate at a substantially constant speed or within a substantially constant or limited speed range, a simple increase in the standard injector pump 2 maximum rack opening position is likely to be sufficient compensation for the reduced calorific value of methanol when compared with diesel oil; but for higher speeds a more complete

retuning of the injection system may be required.

Detailed Description Text (24):
Further modifications for most effective operation under a wide range of engine speeds and loads, as may be required in particular in vehicle operation, can include the installation of further cylinder head and oil temperature control devices, and a methanol or other alcohol fuel recirculation system to prevent vapor lock in the injection pump 2. In more sophisticated engine systems electronics can be employed for the close control of principal alcohol fuel and/or pilot fuel, whereby such supply is subject to control according to engine loading and/or speed; but generally speaking the provision of the basic equipment comprising the controlled pilot fuel pump 8 for determining substantially precise pilot fuel requirements fed to the reactor converter 10 and engine 1, the catalyst or ether generator 10 and the provision of a condensate separator 16 or condenser 18 and means for controlling the supply of drier or dry DME and fuel vapor to the engine 1 in prescribed quantities with the inlet air, will enable employment of the normally provided engine and associated components without major modifications and with sufficient efficiency to enable employment of up to 100% methanol as the main operation fuel and without the need to provide a separate main supply for diesel fuel. The provision for inlet air and/or exhaust gas throttling involves no major change to existing inlet and exhaust systems and is thus a desirably incorporated feature facilitating effective operation under light loads by maintaining gas exhaust temperatures above 250.degree. C.

Detailed Description Text (26):
It will thus be seen that the present invention can be readily applied to existing vehicles or machinery (stationary or moving) employing compression ignition engines normally designed to operate on diesel fuel, with standard "kit-set" componentry; and/or new vehicles and machinery employing compression engines for operation on methanol as described can be provided with relatively little additional costs, and with viable monetary savings and gains in operating costs with the generally lower costs of methanol and other alcohol fuels - without loss in efficiency in operation and with the further added advantages of methanol or other alcohol fuel employment involving clean burning with less air pollution, and also longer engine life under most operating additions, when compared with conventional diesel oil use.

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L8: Entry 1 of 1 File: USPT May 11, 1999

DOCUMENT-IDENTIFIER: US 5901684 A
TITLE: Method for processing crankshaft speed fluctuations for control applications

Drawing Description Text (7):
FIG. 5 is a graph illustrating engine fuel injection modification and shows a programmed fuel control curve contrasted with a modified fuel control curve; and

Detailed Description Text (10):
In order to illustrate operation of the fuel injection modification methodology 100, FIG. 5 illustrates a programmed target fuel injection curve 126 contrasted with a reduced fuel injection curve 128 as provided by the fuel modification multiplier determined as described in connection with FIG. 4. For a period of time following vehicle startup, the fuel modification methodology 100 utilizes the combustion metric value so as to reduce the amount of fuel injected into the individual cylinders of the engine as may be appropriate to reduce hydrocarbon emissions emitted from the vehicle. The time period for modifying the fuel injection preferably lasts long enough until effective feedback control with the oxygen sensor may be realized. The time period may be set for forty seconds, according to one example, however, varying time periods may be necessary depending upon the engine, temperature, fuel combustibility as well as other factors. According to the example shown, it is preferred that the fuel modification methodology 100 be utilized to reduce the amount of fuel injected into the engine. It is also preferred that the modified fuel injection curve 128 does not exceed the programmed target fuel injection curve 126.

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L8: Entry 1 of 1 File: USPT May 11, 1999

US-PAT-NO: 5901684
DOCUMENT-IDENTIFIER: US 5901684 A

TITLE: Method for processing crankshaft speed fluctuations for control applications

DATE-ISSUED: May 11, 1999

INVENTOR-INFORMATION:

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DeGroot; Kenneth	Macomb Township	MI		
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Weber; Gregory	Commerce Township	MI		

ASSIGNEE-INFORMATION:

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APPL-NO: 09/ 152762 [PALM]
DATE FILED: September 14, 1998

PARENT-CASE:
This application is a continuation-in-part of U.S. application Ser. No. 08/901,859, filed Jul. 29, 1997, now U.S. Pat. No. 5,809,969 and assigned to the same assignee as the instant invention.

INT-CL: [06] F02 D 41/04

US-CL-ISSUED: 123/436; 73/117.3, 701/110
US-CL-CURRENT: 123/436; 701/110, 73/117.3

FIELD-OF-SEARCH: 123/419, 123/436, 123/480, 123/491, 73/116, 73/117.3, 701/104, 701/110, 701/111

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	4829963	May 1989	Oblaender et al.	123/436

☐	5050554	September 1991	Ichikawa	123/419
☐	5237862	August 1993	Mangrulkar et al.	73/116
☐	5426587	June 1995	Imai et al.	123/419
☐	5492102	February 1996	Thomas et al.	123/493
☐	5544521	August 1996	McCombie	73/117.3
☐	5605132	February 1997	Hori et al.	123/436
☐	5630397	May 1997	Shimizu et al.	123/436
☐	5809969	September 1998	Fiaschetti et al.	123/436

ART-UNIT: 377

PRIMARY-EXAMINER: Argenbright; Tony M.

ATTY-AGENT-FIRM: Calcaterra; Mark P.

ABSTRACT:

A methodology of computing a learned combustion stability value and applying the learned combustion stability value to control engine operation is provided. Engine speed is sensed for each expected firing of individual cylinders ofthe engine. An expected acceleration value is determined using a band-pass-filtered engine speed difference. The difference between successive expected acceleration values is computed. A learned combustion related value is determined as a function of the difference in the successive learned acceleration values and is an indication of engine combustion quality. The operation of the engine is controlled as a function of the learned combustion related value. The learned combustion stability value is advantageously employed so as to modify the fuel injection to an internal combustion engine, especially following a cold engine start so as to reduce hydrocarbon emissions. This is accomplished by modifying a program target fuel injection value as a function of the learned combustion related value so as to reduce the fuel injected into the engine by fuel injectors.

4 Claims, 6 Drawing figures

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Search Results -

Terms	Documents
L53 and percent$	1

Database:
US Pre-Grant Publication Full-Text Database
US Patents Full-Text Database
US OCR Full-Text Database
EPO Abstracts Database
JPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Search: L56

Refine Search

Recall Text Clear Interrupt

Search History

DATE: Thursday, September 08, 2005 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
DB=USPT; THES=ASSIGNEE; PLUR=YES; OP=OR			
L56	L53 and percent$	1	L56
L55	L53 and coefficient$	0	L55
L54	L53 and factor$	1	L54
L53	5901684.pn.	1	L53
DB=PGPB,USPT; THES=ASSIGNEE; PLUR=YES; OP=OR			
L52	L3 and (emission with sens$)	2	L52

L51	L23 and (emission with sens$)	0	L51
L50	L32 and (emission with sens$)	0	L50
L49	L31 and (emission with sens$)	0	L49
L48	L34 and (emission with sens$)	0	L48
L47	L37 and (emission with sens$)	0	L47
L46	L40 and (emission with sens$)	0	L46
L45	L16 and (sen$ with (gear or transmission))	0	L45
L44	L16 and (sen$ with range with transmission)	0	L44
L43	L39 and (sen$ with range with transmission)	7	L43
L42	L39 and (sen$ with slip$ with range with transmission)	0	L42
L41	L40 not l37	6	L41
L40	L39 and (slip$ with range with transmission)	6	L40
L39	l21 or L38	803	L39
L38	701/54,82.ccls.	651	L38
L37	l30 and L36	4	L37
L36	(slip$ with range with transmission) and vehicle	366	L36
L35	L34 and (control$ with fuel)	13	L35
L34	L30 and (sens$ with power$) and (sens$ with (transmission or gear$))	61	L34
L33	L32 and (mangag$ with fuel$)	0	L33
L32	L30 and (sens$ same load$ same (transmission or gear$))	64	L32
L31	L30 and (sens$ with load$ with gear$)	15	L31
L30	701/50,81.ccls.	1057	L30
L29	((sens$ same load$ same gear$) and (tranmission with rang$))	1	L29
L28	((sens$ same load$ same gear$) same (tranmission with rang$))	0	L28
L27	L21 and ((sens$ same load$ same gear$) same (tranmission with rang$))	0	L27

DB=USPT; THES=ASSIGNEE; PLUR=YES; OP=OR

L26	L7 and (track$)	0	L26

DB=PGPB,USPT; THES=ASSIGNEE; PLUR=YES; OP=OR			
L25	L7 and (driv$ same track$)	0	L25
DB=USPT; THES=ASSIGNEE; PLUR=YES; OP=OR			
L24	L7 and (driv$ adj2 track$)	0	L24
DB=PGPB,USPT; THES=ASSIGNEE; PLUR=YES; OP=OR			
L23	L21 and driv$ adj2 track$	6	L23
L22	L21 and "drive-track"	0	L22
L21	701/50,81.ccls. and L20	155	L21
DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; THES=ASSIGNEE; PLUR=YES; OP=OR			
L20	engine and ((construc$ adj vehicle$) or earth$)	36605	L20
L19	l2 and ((construc$ adj vehicle$) or earth$)	3	L19
L18	l2 and (construction$ adj vehicle$)	0	L18
DB=USPT; THES=ASSIGNEE; PLUR=YES; OP=OR			
L17	L16 and (load$ with fuel$ with suppl$)	0	L17
L16	L15 or l7	3	L16
L15	5121324.pn.	1	L15
DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; THES=ASSIGNEE; PLUR=YES; OP=OR			
L14	L12 and (fuel$ with suppl$)	8	L14
L13	L12 and (fuel adj2 suppl$)	1	L13
L12	vehicle and (rack adj2 position)	1722	L12
DB=USPT; THES=ASSIGNEE; PLUR=YES; OP=OR			
L11	L5 and (fuel$ with limit$)	1	L11
L10	L7 and (control$ with fuel$ with curve)	1	L10
L9	L7 and (modif$ with curve)	1	L9
L8	L7 and (modif$ with fuel$ with curve)	1	L8
L7	L5 or L6	2	L7
L6	5901684.pn.	1	L6
L5	5670830.pn.	1	L5
DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; THES=ASSIGNEE; PLUR=YES; OP=OR			
L4	L3 and (fuel$ with limit$)	10	L4

L3	L2 and vehicle	18	L3
L2	modif$ with fuel$ with curve	69	L2
L1	modif$ with fuel$ with curve with suppl$	1	L1

END OF SEARCH HISTORY